Delayed Credit Rating Changes, Firm Financing and Firm Performance

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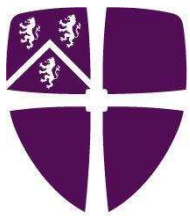
A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Finance



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Abstract

Motivated by the insufficient research in understanding the influences of the delayed changes in credit ratings, the practical importance of information asymmetry as well as the theoretical difficulty of measuring information gap with an appropriate proxy, this thesis regards delayed credit rating change (DCRC) as a source of asymmetric information and exploits whether and how it affects issuer's capital structure adjustments. It uses Compustat North America quarterly data from 1985 to 2010 inclusive.

Rating agencies often delay updating credit ratings, leading to an information gap between bond issuers and the market. This offers issuers (market insiders) opportunities to utilise the delayed credit rating changes as superior information, alongside which, factors capturing the associated benefits and costs of the rating changes and capital structure adjustments, are addressed to form the three key interactive variables in this research: DCRC, capital structure adjustments and firm performance.

First considered are the effects of information asymmetry on financing adjustment before DCRCs. The evidence shows that issuers often adjust debt and equity financing at least one quarter before rating change announcements published by rating agencies. Issuers who anticipate rating upgrades in the next quarter do not significantly change the net debt issuance. Issuers who anticipate rating downgrades increase net debt issuance before rating changes. Secondly, this research is concerned with the robustness of DCRC's effects, which is confirmed by various robustness check tests and incorporating DCRC into tests of the existing capital structure theories. The result confirms DCRC's robust effects on firm financing adjustments. The last issue addressed is the relation between information asymmetry and gains or losses to issuers when utilising the information asymmetry. The results suggest that information asymmetry does bring material effects on firm performance. The three groups of results form a mechanism of delayed credit rating change's real effects and reveal a fresh explanation for issuer's financing decision making under asymmetric information.

To my parents

献给挚爱的父亲母亲

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Declaration

No part of this thesis has been submitted elsewhere for any other degree or qualification in this or any other university. The thesis is all my own work unless referenced to the contrary in the text. A paper based on Chapter III has been produced as a joint work with Dr. Anurag Narayan Banerjee and Dr. Chi-Hsiou Hung.

Acknowledgements

Gaining a PhD degree has always been my childhood dream due to a naive idea at the time: the title ‘Dr’ does not differentiate between genders as other titles do. This offers a rare opportunity for a female to show an equivalent identity in a male-dominated world. However, I hardly understood what ‘Doctor of Philosophy’ really meant when I was younger. I gradually realized that this prized title represents a piece of excellent research in a specific area, the spirit of seeking the truth no matter how difficult and the researcher’s determination to contribute to society through knowledge and distinguished research. It means much more than the title itself. Eventually, after I started my PhD studies, I came to understand the essence of ‘PhD’. Coming this far and being so close to the completion of my PhD, is with no doubt, the greatest challenge in my life so far. I could not have come this far without the support from people around me throughout these years.

I would like to express my deep appreciation of my supervisors Dr. Anurag Narayan Banerjee and Dr. Chi-Hsiou Hung, for their supervision, support, patience and encouragement throughout my study in Durham. They led me step by step to understand the essence of research and finally reach completion stage. It is hard to imagine my academic progress without the intensive and patient supervision they have been given. A special and sincere thank you to Dr. Bilei Zhou, a talented, kind-hearted, young researcher who unfortunately passed away last year. I learned not only professional knowledge from him but I was also stimulated by the way he dealt with life and academic obstacles. In addition, I am very grateful to the faculty staff of Durham Business School who has provided strong support.

My parents are the most important and most respected people in my life. They have provided me the best family, education and all the support they could throughout my life. My father has always been a source of inspiration and my mother is the most remarkable and admirable lady in my heart. They have been my first teachers and I have always revered them.

Finally, a huge thank you to all my teachers from the beginning of my school education encouraged me to study and inspired me the ways of study. Thank you very much.

MENG Qingrui

December 2011

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Chapter I

Introduction

1.1 Motivations of the Study

> *"There are two superpowers in the world today in my opinion. There's the United States and there's Moody's[1] Bond Rating Service. The United States can destroy you by dropping bombs, and Moody's can destroy you by downgrading your bonds. And believe me, it's not clear sometimes who's more powerful."*[2] *(Partnoy (1999))*
>
> The Pulitzer Prize winner and the author of *The World is Flat*
>
> Thomas Lauren Friedman

Credit rating is expression of opinion about credit risk of a security issuing body published by a rating agency. It is a great invention for transmitting financing demanders' information to the market outsiders and the rating industry has boomed in the last century. Given credit rating's long-standing, profound and powerful impact on modern financial markets in the past century, research on quantifying its value and its influence have naturally become a focus of academic study. In part, this is because the market mechanism has offered credit rating a position on the financial market with both information value and endorsement value. Crucially, it is clear that the continuing interest and attentions paid by the market players provides strong motivation for increased academic study in credit ratings. Given the crucial information transmission function of credit rating on the modern financial market, hundreds of papers have investigated the influences of credit rating. Analyses looking at credit rating from investors' angles have been published, with various market reactions observed following credit rating changes.

[1] Moody's is one of the three largest rating agencies. It also has two peers, namely Standard & Poor's and Fitch. Moody's is considered as a representative of rating agencies.
[2] *The News Hour with Jim Lehrer: Interview with Thomas Lauren Friedman* (PBS television broadcast, Feb. 13, 1996) (transcript on file with author).

It is worthwhile noting that the above quotation from the distinguished journalist Thomas Lauren Friedman crystallises his belief based on the preciseness and timeliness of credit rating. Although delayed announcements in credit rating changes have been rationalized through the rating process and demonstrated by rating failure episodes[3], their influence on the financial market has not received sufficient attention in literature.

Market outsiders, institutional investors and academics' forecasting on future credit ratings with the aim of gaining precise and timely credit information about funding hunters has a long history dating back to late 1960's. For example, Pogue and Soldofsky (1969) describe the techniques of forecasting credit ratings by utilising publicly available financial information. Various models forecasting credit ratings are introduced by Ederington (1985). Academic research on credit rating has largely concentrated on evaluating the static ratings and predicting default probabilities (for example, Krämer and Güttler (2008)). It has been shown that such methods may predict the static rating grades fairly accurately, yet, the changes, especially the timing of the changes, are hard to test by current pure mathematical techniques and has been barely documented in the literature so far.

Intrigued by the costs and benefits associated with different credit rating levels, financial economists have amassed in accruing considerable knowledge of the link between credit rating and financing adjustments in the past five years. Kisgen (2006), for example, outlines discrete costs (benefits) associated with firm credit rating level differences and finds these costs (benefits) directly affect debt and

[3] For instance, the Enron, WorldCom, Lehman Brothers' cases all clearly show the delay in credit rating changes.

equity financing decisions. Firms near a credit rating upgrade or downgrade issue less debt relative to equity than firms not near a change in rating. However, the link between delay in credit rating changes and capital structure has not been formally made.

This thesis carries out a detailed inspection on the impacts of delay in credit rating changes on the market. As shown by the working mechanism illustrated in Figure 1.1, when delayed credit rating changes (DCRCs, henceforth) exist on the market, there are information exchanges between the internal information set, signifying issuers and raters in this study, and the external market. Given the information gap opened by the delayed changes of credit ratings, it is assumed that issuers could and would take advantage of this asymmetric information to gain benefits by rebalancing financing costs and benefits and also adjusting their way of financing. For instance, a firm which recently acquires a valuable investment opportunity, the current rating of the firm may not reflect the potential profits from these opportunities, or the improved credit quality resulted from recent financial position. Thus, a rating upgrade coming with a time lag would cause a potential loss before the announcement is made by the rating agency. Conversely, a delayed rating downgrade may bring some opportunities for issuing cheap securities. DCRC creates information asymmetry and it may cause real impacts on insiders' financing strategy.

[Insert Figure 1.1 here]

The two main imperfections in the financial market are information asymmetry and the agency problem, both of which have played a central role in corporate

finance literature and practice. Academic research has been investigating the influence of information asymmetry on various market issues. Yet, partly due to the breadth of issues, previous academic investigation has been severely limited in many aspects of measuring information asymmetry. This study, however, makes considerable progress in addressing measuring this issue. It emphasizes the time delay of rating changes, which creates information asymmetry before the announcements are made.

This thesis first examines DCRC's significant influence and finds strong empirical evidence that market insiders utilise the powerful delayed credit rating changes to gain benefits through financing adjustments. Using private information to improve capital structure before rating changes might decrease an issuer's financing cost while keeping the rating at a particular level[4] which is a significant indicator of the borrower's reputation. This study fills the gap in the literature in this area, by investigating rating change's influences from an insider's perspective.

Furthermore, since the general theory of capital structure has not been found and experts have suggested that it should not be expected (Myers (2001)), this thesis incorporates DCRC hypothesis individually into three dominated capital structure theories, the trade-off theory, the pecking-order theory and market timing theory, which are based on different assumptions. The study finds that DCRC hypothesis is more likely to be incorporated into the theories which are based on information asymmetry assumptions.

[4] Kisgen (2006) argues that firms put efforts on avoiding downgrades and achieving upgrades due to the benefits of high ratings.

The second imperfection on the financial market is the agency problem, which further extends the study by examining the firm performance changes caused by financing adjustments before DCRCs. The agency theory links the two elements in a corporate governance context. Motivated by the second imperfection factor, this thesis tests the issuer's real benefits in firm performance, for example, ROA, EPS and Tobin's Q, gained through financing adjustment before DCRC.

In summary, this thesis aims to fill the gap identified from the literature by investigating how the issuer's DCRC affects firms' financing, which will help to explain role of the information asymmetry driven by credit ratings. The three related research questions addressed by this thesis are:

(1) do delays in credit rating changes have real influences on issuers' financing adjustments and why?
(2) do DCRC hypotheses incorporate with the existing dominated capital structure theories?
(3) whether and how issuers' adjusted financing capital structure affect the improvement in firm performance of these adjusted financing strategies before rating changes.

1.2 Main Findings

This thesis makes use of a large sample of Compustat North America finance data and S&P rating data from 1985 to 2010 inclusive. The evidence gained from this data sample shown in the three empirical chapters, Chapter III, IV and V, supports the DCRC hypotheses and indicates the DCRC's effects on financing strategy and

firm performances of the issuer's firm. The most crucial findings are the responses of firm issuers to DCRCs which vary among different types of issuers. 'Good' issuers who anticipate next-period rating upgrades, do not significantly increase or decrease net debt issuance, which is defined as the gap of debt issuance and equity issuance. 'Bad' issuers, who possess private information about the next-period rating downgrades, significantly increase net debt issuances by about 1.065% of the total asset. Secondly, issuers react differently to changes in long-term and short-term credit ratings due to different costs and benefits associated with the change of ratings and are thus motivated accordingly. Thirdly, issuers in different credit rating grades, investment grade and speculative grade, respond to DCRCs on different scales. Lower-graded issuers respond more significantly due to the wider information gap between them and market outsiders than that between higher-graded issuers and market outsiders.

The robustness tests in Chapter IV further confirm DCRC hypotheses. The chapter also incorporates DCRC hypotheses into the dominant existing capital structure theories and finds that the DCRC dummies are significant in the test of pecking order theory and market timing theory. Chapter V finds that DCRC's effects extend to firm performance due to issuer's agency problem. Changes in ROA, EPS and Tobin's Q, applied as measures of firm performance, have been tested around the time of DCRC taking place. The results gained from simultaneous equation systems show that 'bad' issuers' firm performances are temporally improved by adjusting their net debt issuances one period before DCRCs.

This research contributes to information asymmetry and corporate financing literature in three aspects. Specifically, the existing research does not specify the

working mechanism and rationality of the impact of ratings and thus does not evaluate the financing adjustments before rating changes from the issuers' perspectives. In fact, measuring information asymmetry with proper proxy variable has always been a difficult issue in the relative research areas and most existing research has not succeeded in evaluating and applying delay in credit rating changes as they are actually anticipated by insiders. Analysing credit ratings change as the factor opening the window of information asymmetry and therefore fills a gap in credit rating related research area. Secondly, given the DCRC hypothesis stands, the existing capital structure theory tests are incorporated by DCRC dummy variables. The evidence shows that the DCRC hypothesis could be partly incorporated into the existing capital structure theories, especially the ones heavily based on assumption of information asymmetry. Last but not least, with various simultaneous equation systems and evaluation techniques, the study has been further extended to test the agency problem of issuers, by which the relations between capital structure and firm performance are addressed and tested.

To summarize, the findings of these three empirical chapters, together with the related theoretical rationale, implicate several information-related factors inherent in the credit rating information dissemination process. Although some research efforts have been made towards to information asymmetry in the past few decades, few of them can adequately provide a thorough measuring proxy of it. The dummy variable of DCRC in this study provides an independent and powerful proxy of information asymmetry. The values and effects of DCRCs, as well as the mechanism under which these effects work, expand the limited focus offered by the existing research, which examines the relationship between delays in credit rating

changes and firm financing and performances, into an explicit and timely context. It further highlights the significant role of rating played as asymmetric information in rationalizing the behaviours and performances of issuers when facing the market imperfections.

1.3 Thesis Outline

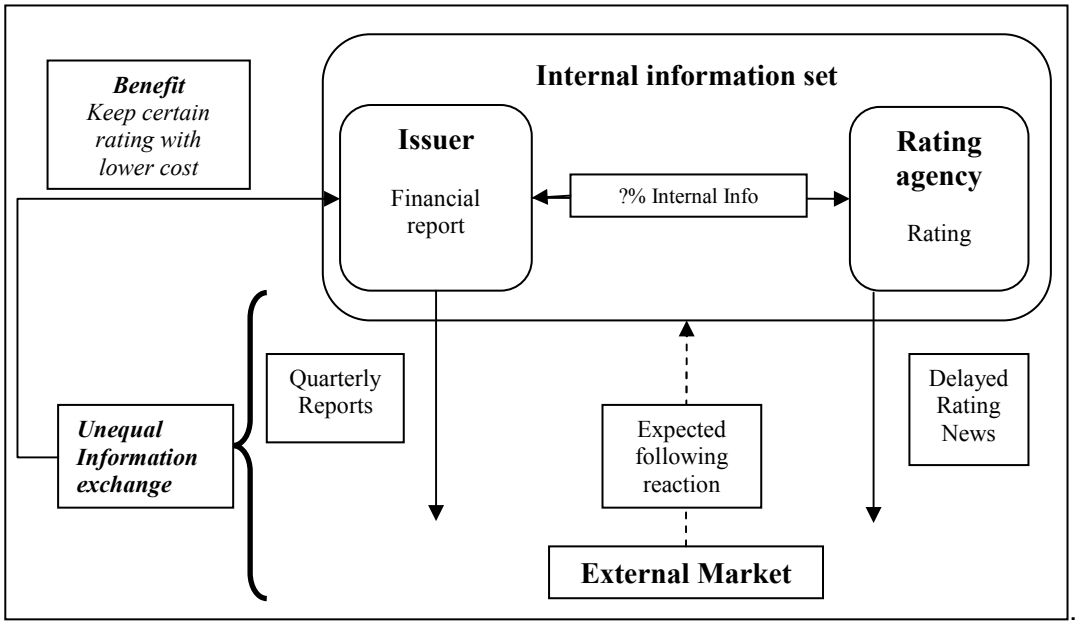
The rest of the thesis is organized as follows. Chapter II reviews studies into the credit rating concept, rating process, the mechanism created delay in credit rating changes (DCRC) and the relationship between DCRC and financing adjustments. Given the evidence of DCRC in Chapter II, the working mechanism of DCRC is introduced and its material influences on issuer's financing and performance are presented in Chapter III. Following DCRC's influences tested by the OLS regression, Chapter IV investigates the robustness of DCRC's influences. In particular, it adopts four robustness check tests: logit model indicating issuer's binary choices between equity and debt before DCRC, tests excluding outliers, MM estimation avoiding outliers' influences in OLS regressions, and mixed model testing time and industry effects. Moreover, the chapter incorporates the DCRC hypothesis into existing capital structure theories. So far, one under-investigated question is 'do financing adjustments driven by DCRCs really bring real outcomes?' Empirical work in Chapter V investigates this compelling area. This provides a crucial element of analysis to confirm the benefit of financing adjustments before DCRCs, significantly extending the analysis of head and shoulders patterns. It expands on the first two empirical chapters by estimating simultaneous-equation

systems, through which it shows the evidence of real outcomes from financing adjustments driven by DCRC.

Each empirical chapter is presented independently. Figure 1.2 illustrates the structures of the three relatively independent empirical chapters. Together, these three empirical chapters provide new insight into a number of important aspects of information asymmetry. The findings are relevant, and of interest to those outside the academic community, given the continuing and gradually growing attention from market practitioners. Chapter VI provides a summary of conclusions and recommendations for future research.

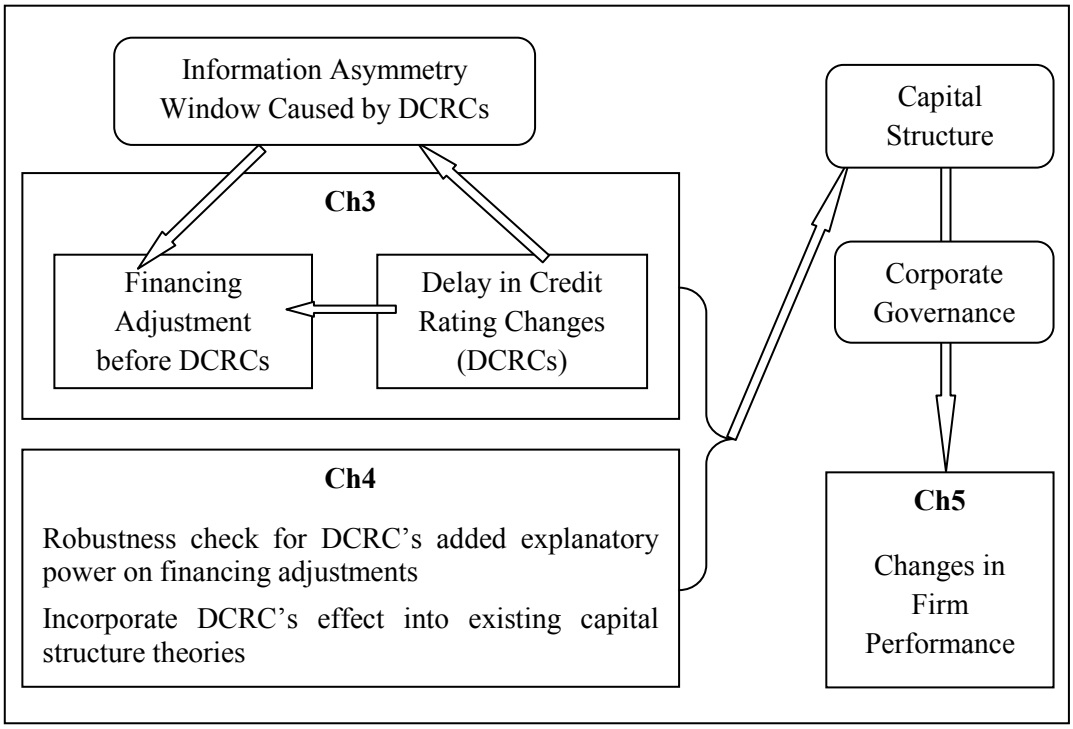
[Insert Figure 1.2 here]

Figure 1.1 The working mechanism of asymmetric information effects



Note: In the graph above, there is information transfer from issuer to rating agency. The U.S. Securities and Exchange Commission's (SEC's) Regulation Fair Disclosure implemented on October 23, 2000, which prohibits U.S. public companies from making selective disclosure of non-public information to financial professionals such as equity research analysts, specifically excludes credit rating agencies, which are allowed to continue to receive non-public information from companies. Although the agency, for instance, Moody's argues in Mahoney (2002) that 'Rating agencies routinely request nonpublic data in the course of their surveillance activities. However, unlike accounting firms, rating agencies have no authority to demand such data, and indeed many firms do not provide requested data. (Indeed, issuers are under no obligation to cooperate with rating agencies at all.) Therefore, while it is clearly reasonable to expect rating agencies to do their best to discover relevant non-public data in the course of their surveillance activities, they can only work with the information which has been disclosed or which management has elected to provide.'

Figure 1.2 Structure of thesis, hypothesized relations and transmission mechanism among delayed credit rating changes, financing strategy and firm performance



Chapter II

Literature Review

2.1 Chapter Outline

This study investigates the relations among delayed credit rating change (DCRC), capital structure adjustments and firm performance, and the transmission mechanism conducting delay in rating changes to firm performance. The work builds on four strands of literatures: credit rating, capital structure, links between credit rating and capital structure, and relations between capital structure and firm performance.

This chapter begins with a review of the development of credit rating and the credit rating industry, which create profound influences in the modern financial market. Meanwhile, the delay of credit rating changes is confirmed and highlighted in order to show the information asymmetry between issuers and outsiders created by this. DCRC is an essential element in the understanding of the financing adjustments and firm performance improvements throughout this study. Having provided an overview of the rationale underlying the existence of delayed credit rating changes in the financial market, this chapter then presents a brief review of the documented capital structure theories. Next, recent studies incorporating credit rating into capital structure research are carried out. Last but not least, firm performance improvement, in relation to these determinants, is addressed in proposal of the research on the relevance of gaining benefits to both DCRC and financing adjustment driven by DCRC.

2.2 Credit Rating

2.2.1 Credit Rating Industries

Lewis Tappan established the first credit rating agency, Mercantile Agency, in New York in 1841 (Atherton (1946)). Tappan kept files on firms, reviewed their characteristics and their credit-worthiness to help market outsiders to gauge a firm's trustworthiness. By exploiting his abolitionist connections across the country, Tappan created a network of correspondents to offer up-to-date, reliable, objective and comprehensive credit information. By 1846, the business was well developed and opened offices in Boston, Philadelphia and Baltimore. The first rating guide was published in 1859 by Robert Dun. A similar mercantile rating agency, formed in 1849 by John Bradstreet, published a ratings book in 1857 (Cantor and Packer (1994))[5]. In 1860, the lawyer and financial analyst Henry Varnum Poor published the 'History of Railroads and Canals of the United States' and he later published annual updated versions of his book with his son.

In 1909 John Moody rated the first railroad bond and extended his ratings to utility and industrial bonds. This compelled the ratings agencies increasingly to move towards assigning ratings to securities. Fitch Publishing Company was founded in 1922. Standard Statistics, founded in the same year as Fitch, and Poor's Publishing Company, which issued its first ratings in 1916, merged to form Standard and Poor's (S&P, henceforth) in 1941[6]. By then, all three major ratings agencies of today's market were all established. Along with these three largest raters, information about other rating agencies is listed in Table 2.1.

[Insert Table 2.1 here]

[5] In 1933, the two agencies were consolidated to form today's popularly known Dun & Bradstreet, which became the owner of Moody's in 1962 but spin off in 2000.
[6] The company's ratings services could be traced back to 1860.

It has been more than 100 years since John Moody provided the first corporate rating for a railway bond in 1909. Now credit ratings stand in a prominent position in financial markets. From the report issued by the Securities and Exchange Commission in January 2003, it is obvious that the significance of credit ratings to issuers has been emphasized over time. It is noteworthy that the rating agency's opinion might impact an issuer's access to capital, cost of capital and the structure of financial transactions. In today's financing market, nearly all large corporate bond issues are rated by at least one rating agency.

Since capital flows between international financial markets, credit ratings are in use in the financial markets of most developed economies and several emerging markets (Dale and Thomas (1991)). Nowadays, the credit rating of the corporations has been widely considered as one of the most important indicators reflecting the probability of the default. The Economist concluded that credit rating agencies 'are among the most powerful voices in today's capital markets' (Kisgen (2006)).

2.2.2 Standard & Poor's Ratings

Since this thesis mainly adopts Standard & Poor's rating data, this section introduces rating process and S&P credit ratings, which are evaluated based on information furnished by the obligors or gained by S&P from other sources they consider reliable[7] (Standard & Poor's corporate ratings criteria (2008)).

The rating process is not limited to an examination of various financial measures, but includes quantitative, qualitative and legal analyses. According to the

[7] 'Although we look at information we receive with a critical eye, we do not perform any kind of audit (of financial statements or transactions) in connection with any credit rating—and may, on occasion, rely on unaudited financial information.' (Standard &Poor's corporate ratings criteria (2008))

description in Standard & Poor's corporate ratings criteria published in 2008, S&P assembles a team of analysts with appropriate expertise to review public information and internal company files, including operating and financial plans, management policies, pertinent to the rating and assesses projected performance when a firm requests the ratings service. A lead analyst is responsible for conducting the analysis and coordinating the rating process. A number of rating committee meetings is convened. The committee discusses the head analyst's recommendation and the facts and expectations supporting the rating recommendation at the meetings. Finally, the voting members of the committee vote on the recommendation. The issuer is subsequently notified of the rating and the major considerations supporting the assignment of the rating. The issuer can appeal against the notified rating before it is disclosed to the public by supplying new information[8] (Crouhy, Galai and Mark (2001)), though it is not guaranteed that the new information will convince the rating committee to alter their final decision. Once a final rating is assigned, it is conveyed to the public via S&P RatingsDirect, S&P.com, and the news media, together with the rationale and other commentary. In the U.S., Standard & Poor's assigns and publishes its ratings irrespective of issuer request, if their financing is a public deal. After the assigned rating is announced, the rater adds the issue to their surveillance system. The rating process of S&P is described in Figure 2.1.

[Insert Figure 2.1 here]

[8] Moody's policy is to simultaneously announce a final rating to the issuer and to the public, rather than giving the chance for appeal.

S&P issuer credit rating provides an opinion of the obligor's overall capacity and willingness to meet its financial obligations as they become due. As a result of the surveillance process, the significant change in issuers' conditions requires reconsideration of the outstanding rating. The rating committee will put the rating under review and recommend a new rating. The process is exactly the same as the rating of a new issue.

The rating agency makes a distinction, in its rating system and symbols, between long-term and short-term credits, for which rating agencies maintain separate and well-established rating scales. S&P long-term credit ratings, assigned to long-term obligations (normally more than one year), are divided into several categories: ranging from 'AAA', reflecting the strongest credit quality, to 'D', reflecting the lowest. Except for 'AAA' and 'D', the rest of the ratings are modified by the addition of a plus or minus sign to show relative standing within the major rating categories. S&P short-term ratings, assigned to short-term obligations (less than one year), range from 'A-1', for the highest-quality obligations, to 'D', for the lowest. The 'A-1' rating is modified by a plus sign to distinguish the strongest credits in that major category.

2.2.3 Credit Rating in Financial Markets

As the complexity of financial markets and the diversity of borrowers has been growing over time, investors and regulators have increased their reliance on the opinions of the credit rating agencies (Crouhy *et al.* (2001)). Rating agencies enjoy privileged access to issuers' financial situation and consequently ratings should potentially convey new information to market participants. Large number of

previous studies discussed the information content of credit ratings, which might lead to changes of security prices and financing costs.

In the literature on the information value of credit rating, pricing-relevant information value is the principal area that has been explored. Bond rating as public information was theoretically considered to be reflected in security price.[9] Thus intuitively, security price fluctuation should happen around rating changes. The main early studies include Katz (1974), Hettenhouse and Sartoris (1976), Grier and Katz (1976), Pinches and Singleton (1978), Griffin and Sanvicente (1982), and Ingram, Brooks and Copeland (1983), which all put their efforts on investigating security-price reactions to rating changes, yet it seems those discussions have not come to be conclusive.

In particular, studies in this area originated from investigating the efficiency of the bond market driven by earlier discussion on market efficiency. Specialising the research question, the focus was put on the price adjustments associated with rating changes. Early empirical tests started exclusively with measuring the rating change's impact on bond yield to maturity and discovered that bond price adjustment following rating changes seemed not significant according to empirical test results. For instance, Katz (1974) claims that it was surprising that 'no anticipation exists prior to a public announcement of reclassification' and that firms react 6-10 weeks later to the announcement of rating changes. It indicates that 'little institutional research is being done to determine the proper credit level of bonds, and that bond investors appear to rely primarily on the pronouncements of the rating agencies as determinants of bond value'. Hettenhouse and Sartoris (1976)

[9] Capital market efficiency requires that prices fully reflect all available information.

discovered little anticipation before downgrades but no reaction to upgrades. Grier and Katz (1976) introduce the impact of rating changes on utility bonds and indicate that industrial bonds are generally more volatile on reacting to the rating's re-classification than are utility bonds.

After noticing that ratings can be a market signal containing information, experts started to converse the focus on stock prices. Pinches and Singleton (1978) extended the rating impact to stock markets but found 'the information content of bond rating changes is very small' and thus argued the stock market seems efficient in processing the information from both bond rating upgrade and downgrade. Griffin and Sanvicente (1982) examined the adjustments in common stock price of firms whose bond rating is about to be reclassified or currently under reclassification and found the common stock price appeared to adjust with rating announcement although they couldn't make out a competing explanation at then. The municipal bond market was studied by Ingram *et al.* (1983) and found that the valuation changes in the municipal bond market occur simultaneously with rating changes.

More common significant security price changes, along with the credit rating reclassifications have been indicated through the results of empirical tests in a large body of related literature since 1990s. Hand, Holthausen and Leftwich (1992) concludes overall that both bond and stock prices are significantly affected by announcements of the credit Watchlist and actual rating changes from Moody's and Standard and Poor's but show asymmetric results for real upgrade and downgrade as well as investment grade and speculative grade. Goh and Ederington (1993) discuss the impact of bond rating downgrades on stockholders and claim

downgrades to stockholders are 'bad news' containing negative information only when they are accompanied by deteriorating financial expectations but not when downgrades are caused by leverage changes. Kliger and Sarig (2000) find that 'the effect of the fine-rating information on bond prices is monotonic in firm leverage'. Steiner and Heinke (2001) utilised a sample of international bonds to investigate price impacts of both downgrades and reviews for downgrade. 'Significant bond price reactions are observed 90 days before announcements of downgrades and negative watchlistings while upgrades and positive watchlistings do not cause announcement effects.'

Recent studies also show the interest in specialized market related to credit ratings. Similar asymmetric price effect was found by Ammer and Clinton (2004) on the pricing of asset-backed securities. They find that negative reaction on returns and widening spreads tend to happen together with rating downgrades, which suggests that 'ABS market participants appear to rely somewhat more on rating agencies as a source of negative credit news'. Pukthuanthong-Le, Elayan & Rose (2007) investigate the impact of sovereign credit ratings, which are affected by a borrowing country's macro-factors, including economic political and social variables.

Apart from ratings' information value, rating also contains endorsement value since some regulations are tied to ratings. Along with the increased significance of credit ratings, policy makers refer to the ratings when they draft financial regulations and this drives the so called endorsement value of ratings, namely institutional and regulatory constraints which may cause ratings to put an impact on asset prices. On one hand, it is an obvious incentive for rating agencies to market

itself by arguing that their rating is entry trigger in markets. S&P argues one of the key benefits of having ratings is that ratings often provide the issuers with an 'entry' ticket in public debt markets, broadening the issuers' financing opportunities (Dallas (1997)). Mahoney (2002) and Cantor and Mann (2007) from Moody's state the trade-off between rating accuracy and stability.

There are evidences in the previous studies which show the endorsement value of bond ratings, i.e. different impacts on highly-rated bonds and lowly-rated bonds. Kliger and Sarig (2000) suggest that the impact of rating announcements is greater on firms with high leverage (which are typically rated speculative-grade) than those with low leverage (which are typically rated investment-grade). Steiner and Heinke (2001) 'indicates that the announcement effects can in part be explained by price pressure effects due to regulatory constraints rather than original information content of rating changes'. Kisgen and Strahan (2011) show that ratings-based regulations of bond investment affect the cost of debt, which further supports the existence of endorsement value of credit ratings.

Except for the voice from rating agencies, some literature has gathered the current existing rating-related regulations and explained the rationale for policy makers to consider credit ratings. For example, many mutual funds, pension funds and institutional investors are not allowed to invest in low-quality bonds below certain levels. Cantor and Packer (1997) have provided a list of the historical events selecting uses of ratings by regulators in the U.S. Dating back to as early as 1936, banks were prohibited from holding speculative grade bonds by the regulator. The regulations blocking public funds invested in lower-rated issues are being enhanced in the following years. For instance, the Congressional Promulgation of the

Financial Institution Recovery and Reform Act of 1989 prohibited savings & loan institutions from investing in below-investment-grade bonds and specified pension fund to be invested in highly-rated issues, which are those of investment grade. The regulation body, the U.S. Securities and Exchange Commission, has recognized the significantly increased importance of credit ratings to investors and other market participants in recent years, which impact an issuer's access to and cost of capital, the structure of financial transactions, and the ability of fiduciaries and others to make particular investments. The Commission 'had commenced a review of the use of credit ratings in federal securities laws, the process of determining which credit ratings should be used for regulatory purposes, and the level of oversight to apply to recognized rating agencies.' Micu, Remolona and Wooldridge (2006) point out that many financial contracts link payment conditions to credit ratings and give an example that 'some debt contracts specify that a downgrade entitles creditors to demand immediate repayment and other contracts that a downgrade triggers a higher coupon.'

2.2.4 The Fact of Delayed Credit Rating Changes

The timeliness of the ratings has been suspected recent years, namely whether the ratings can be considered as effective signals to reflect default risk to issuers and investors, especially after the tardy reactions of agencies in the cases such as Enron and WorldCom. Report of Securities and Exchange Commission in 2003 emphasized the investigations of the fact of delayed credit rating changes during Enron scandal from the government's angle. The US Senate Hearings (2002): ''On March 20, 2002, the Senate Committee held a hearing – entitled 'Rating the Raters: Enron and the Credit Rating Agencies'. The hearing sought to elicit information on

why the credit rating agencies continued to rate Enron a good credit risk until four days before the firm declared bankruptcy [...].'', and the US Senate Staff Report (2002): ''[...] in the case of Enron, credit rating agencies displayed a lack of diligence in their coverage and assessment of Enron.''

Firstly, the evidence of delay in ratings is shown through the rating process described by Kliger and Sarig (2000). Since the information gathered by the rating agencies is usually from the historical data and the annual reports, the ratings will only reflect the historical financial situation of the corporations and therefore there will be a time lag for the ratings. However, when it enters to the supervising step, an alternative reason is that rating agencies don't change the credit ratings very frequently in order to keep continuity and stability. Boot, Milbourn and Schmeits (2006) argue that rating agencies grant issuers time to recover before disclosing real rating actions. However, raters argue they are doing long-term evaluation and this will benefit the stability of the financial system.

In fact, the concern about inefficient rating started more than three decades ago when rating agencies' obvious failures occurred. The bond rating agencies have been under increased scrutiny since failing to predict accurately and to warn investors of impending firm-related financial difficulties such as the Penn-Central bankruptcy[10]. Pinches and Singleton (1978), conclude the lag period was around 15-18 months if there are no company-specific events, creating the term 'rate changing lag' and introduced the definition as

[10] The Pennsylvania and New York Central Transportation Company, almost always called Penn Central, was an American railroad company that operated from 1968 until 1976. The American financial system was seriously shocked about its bankruptcy when after only two years of merger.

> *'the difference between the time investor's actions signify their recognition of significant changes in the prospects of the firm (as evidenced by abnormal residuals) and the time the rating agency changes the firm's bond rating'*

The definition is defined from investor's angle rather than from the issuers.

Although rating agencies have been trying to improve the quality of credit ratings, they are still not a very precise signal. In recent few years, Moody's issued several short reports clarifying their rating policy and process. They dispute the views of investors concerned about the stability of ratings in particular, investors believe that ratings should emphasise medium to long-term fundamentals. Mahoney (2002) from Moody's states that the investors 'feel that market opinion (as expressed in stock prices and credit spreads) is volatile, and that incorporating it into bond ratings would produce a pro-cyclical feedback process leading to even greater volatility and further disruption of the capital formation process'. Micu *et al.* (2006) summarises that ratings would not be revised if the impact of events on credit quality is expected to be temporary, uncertain or reversible, such as a slowdown in economic growth, a prospective merger or a decline in profit margins. 'Rating changes are frequently driven by stale information.' Boot *et al.* (2006) argues rating agencies grant issuers time to recover before disclosing real rating action.

Secondly, as stated in Partnoy (2006), credit rating agencies are not like other gatekeepers mainly because they face conflicts of interests that are potentially more serious than those of other gatekeepers. Being paid directly by issuers, they have

potential incentives to postpone the announcements of downgrades. Furthermore, the fact that credit rating agencies rate new complex debt products in recent years, particularly structured finance such as credit derivatives, shows that they could choose the rating business lines which generate higher revenues and profits. Partnoy (2006) believes that the agencies could become more like 'gate openers' rather than gatekeepers.

Thirdly, bad news does not reach the market as quickly as good news. The issuers in good positions have an incentive to let agencies get more internal information to move to a higher grade[11]. In contrast, bond issuers pay to the agencies to get benefit from the ratings. If they are in a bad financial position, they will try to not disclose the information to the agencies to avoid the potential rating downgrade. Also, the agencies cannot force the issuers to disclose the non-public information, thus having to spend more time and resources to get accurate information. All the above potential reasons cause the time lag of credit ratings.

In summary, the primary causes of the rating inveracity may come from three major aspects: one is the agencies' limited access to important information which is not in the public domain[12]; second is the conflicts of interests faced by the rating agencies; last but not least is that even if agencies got some private information, they do not change the credit ratings very frequently but update them after a period of observation and conversation with the market participants, by which they keep the continuity and stability of the rating and thus their professional reputation in the financing market.

[11] The managerial behavior is called the discretionary disclosure hypothesis (Bae, Lim and Wei (2006)).
[12] For example, in Jan 2008, Raymond W. McDaniel Jr., the chief executive of Moody's said on World Economic Forum that "information quality" given to Moody's, "both the completeness and veracity, was deteriorating" as the subprime mortgage market grew.

2.3 Capital Structure

Capital structure decisions are quite complex processes and theories in the area are difficult to be generalised due to the question's diversity and complexity (Margaritis and Psillaki (2010)). Myers (2001) argues that 'Yet even 40 years after the Modigliani and Miller research, our understanding of these firm's financing choices is limited'.

A company's mixed financing of debt and equity is termed its capital structure. The financial manager's responsibility or objective is to maximize the firms' value as well as the wealth of the shareholders. Management thus addresses the concept 'optimal mix' of financing, and identifies a ratio which minimizes the cost of capital, so that the firm's value can be maximized. A firm's cost of capital is measured by the weighted average cost of capital (WACC), which relates the cost of both equity and debt. The Modigliani–Miller Theorem (M&M, henceforth) (1958) began the modern theory of capital structure. It states that the value of a firm is unaffected by how that firm is financed when the market is perfect. Yet, capital structure does matter for practitioners of corporate finance, namely in the real world a company's value is affected by the capital structure it employs because of the existence of taxes, bankruptcy costs, agency costs and asymmetric information.

Taxes are the major factor considered in the Trade-off Theory. Higher taxes on dividends encourage more debt (Modigliani and Miller (1963) and Miller and Scholes (1978) in Baker and Wurgler (2002)). Higher non-debt tax shields motivate less debt (DeAngelo and Masulis (1980) in Baker and Wurgler (2002)). The Trade-off Theory also considers the cost of financial distress positively associated with

high debt ratio, which may stop firm pursue profitable investment opportunities (Miller (1977)). Firm managers thus have to choose the debt ratio at a suitable level.

Information asymmetry frequently exists on the current financial market. Three main points, highlighted by Myers and Majluf (1984), can answer for the feature of information distribution. Firstly, gathering and verifying the information may be costly, and thus may hold back investors' access to such information although a publicly listed firm is legally obliged to supply sufficient verifiable information to reveal its true condition to the market quarterly or annually. Secondly, there should always be delays in the information disclosure process. Thirdly, even if there are no (or fairly low) costs incurred and no need to guard proprietary information, outside investors may still be subject to information disadvantage. This is because the organizational knowledge possessed by managers allows them to report their firm's information with the way they assume is favourable to them. This knowledge is unattainable and undetectable for outside investors. The inevitable, uneven information distribution may result in potential gains, generated by an information advantage, to firms making capital structure plans.

Agency problem is another imperfection driving the adjustments in capital structure. There are mainly two types of agency cost which may help to explain its relevance to capital structure. First is the asset substitution effect. Management has an increased incentive to undertake risky (even negative NPV) projects as D/E increases. The motivation behind it is the shareholders' upside gains when the project is successful. Even if the project is unsuccessful, debt holders get the downside. There is a chance of firm value's decrease and a wealth transfer from debt holders to share holders if the projects are undertaken. Second is the under

investment problem (or debt overhang problem). If debt is risky (e.g., in a growth company), the gain from the project will accrue to debt holders rather than shareholders. Thus, management is motivated to reject positive NPV projects, even though there is a potential to increase firm value.

By extrapolating upon the classical Modigliani–Miller Theorem, literature in the past several decades has developed several schools of thought in theorizing and rationalizing the study of capital structure based on setting up various assumptions. As summarized in Harris and Raviv (1991), which is based on over 150 published and unpublished papers from the mid-to-late 1970's, four categories of determinates of capital structure have been identified:

(i) Agency costs: ameliorate conflicts of interest among various groups with claims to the firm's resources, including managers (the agency approach);
(ii) Asymmetric information: convey private information to capital markets or mitigate adverse selection effects (the asymmetric information approach);
(iii) Product/Input market interactions influence: the nature of products or competition in the product/input market;
(iv) Corporate control considerations: affect the outcome of corporate control contests.

A fairly small number of 'general principles' are evident despite many factors emerged from the theory and many issues discussed based on specific assumptions. The most dominant capital structure theories so far are: the Trade-off Theory and the Pecking Order Theory. However, the empirical relevance of the two classical financing theories seems to be controversial and has often been questioned. For

instance, Miller (1977) suggested that if the Trade-off Theory were factual, then firms should have had much higher debt levels than researchers observe in reality. Myers (1984) raises a modified pecking order theory which recognizes both asymmetric information and the cost of financial distress, but is 'grossly oversimplified and under qualified'. Fama and French (2002) criticized both the Trade-off theory and the Pecking Order Theory after testing the dividend payout ratio. Myers (2001) discusses three prevalent capital structure theories: the Trade-off Theory, the Pecking Order Theory and the Free Cash Flow Theory, but considers them conditional theories which only work in particular situations and mentions that deeper and less conditional theory on capital structure may exist.

Credit rating, as a crucial factor transmitting information in the modern financial market, stimulates the study connecting itself to asymmetric information. As discussed above, information asymmetry, as one of the most popularly discussed imperfections on the financial market, is a crucial factor affecting capital structure. The credit rating has made concrete information effect on capital structure from its delays in this study.

2.4 Credit Ratings and Capital Structure

2.4.1 The Original Links

Credit rating is a significant indicator of the borrower's reputation in the financial market and may change security prices, issuer's financing cost as well as effectively providing issuer an entry ticket to public debt capital. Thus its change has real consequences to issuers. Figure 2.2 shows firm's leverage by credit ratings with the

data adopted in this research, which indicates the relations between credit ratings and leverages. The leverage is negatively related to ratings in general: the higher the rating, the lower the leverage. The firms without a credit rating on average have lower leverages, which indicates the rating's importance to the firm's financing access.

[Insert Figure 2.2 here]

The history of indicating the connection between credit rating and capital structure goes back to Grier and Katz (1976), which states factors such as the expected future earnings, the debt-equity ratio and the liquidity of the firm are considered undoubtedly in the procedures used by various agencies to determine the ratings even if the procedures are confidential. The early study Diamond (1991) starts a theoretical model analyzing the maturity structure of debt financing given borrowers hold private information about their future credit rating. Fons, Cantor and Mahoney (2002) from Moody's conclude that the rating system remains very important position to the thinking and behaviour of investor and issuer after Moody's serious communication with market participants.

Growing interest in research in the area linking credit rating with corporate financing policy emerged in the recent decade, for instance, Faulkender and Petersen (2006), Kisgen (2006), Kisgen (2009), Tang (2009) and Sufi (2009). Faulkender and Petersen (2006) find that firms which have access to the public bond markets, as measured by having a debt rating, have significantly more leverage. Kisgen (2006) defines firms near a change in rating as those being rated with either a plus or minus, with which it examines to what extent credit ratings

directly affect capital structure decisions. It argues credit rating changes drive discrete costs/benefits which vary in different rating levels thus influening debt and equity financing decisions. Kisgen (2009) shows that firms reduce leverage following rating downgrades. Tang (2009) studies firms' financing and investment decisions following Moody's credit rating refinement in 1982. Sufi (2009) suggests that third-party certification by rating agencies increases the availability of debt financing for firms.

However, literature has mainly discussed how firms respond to rating changes after the news announced by raters rather than how firms react to the changes when they are delayed and the delay could be foreseen by firms earlier. There is little research or empirical evidence shown on the precise mechanism driving the relations between ratings and capital structure, in particular, addressing financing adjustments before credit rating changes due to its delay and the private information caused by the delay.

2.4.2 The Significance of DCRCs for Financing Decisions

As discussed in section 2.2.4, issuers know their financial related information prior to the market. Combining the agency's rating criterion, the issuer is able to predict future rating changes as soon as they realise their updated financial situation. Yet, the rating agency[13] would not know the issuer's internal information at the same time the issuer knew, thus they are not able to update the rating. Even if the raters received superior information from the issuer before it is publicly disclosed, they would normally change the rating only when they can confirm a long-term trend.

[13] In this thesis, the terms of 'rating agency' and 'rater' mean the same.

These facts naturally address the question 'would the delay in credit rating change open a window for information asymmetry'?

In reality, the existence of information asymmetry and its influence are hardly diminished even in a relatively efficient market. Firstly, the costs in obtaining and verifying a firm's private information may be significant. Although firms are legally obliged to supply sufficient verifiable information to reveal its true condition, the policies are never able to regulate all the details that firms have to disclose to the public. Secondly, outsiders may still find themselves suffering from an information disadvantage even if there are no costs incurred and no need to dig for proprietary information. This is because the professional knowledge possessed by firm managers allows them to interpret the information and report it in a favourable manner. This is almost unperceivable to outsiders. This inevitable, uneven information distribution in the market may result in potential gains to the insiders.

Information asymmetry has always lain at the heart of determinates of capital structure studies. Over 40% of the theoretical models enrol information asymmetry in the theory summary of Harris and Raviv (1991). Despite the increasing focus on it, existing theories fail to give firm's financing behaviour a conclusive theoretical explanation after enormous research done to capital structure mentioned asymmetric information. This is mainly due to the difficulty in finding appropriate proxies for changes in the levels of information asymmetry (Tang (2009)). For instance, the difference in information has been emphasized in the context of the pecking-order theory, yet further research has been obstructed by finding a good measure of information asymmetry.

The time gap between issuer's realization of future rating change and real rating change are termed as the delayed credit rating changes (DCRC) in this study, which leads to the information gap between issuers and the external market, thus provides opportunity to the former to maximize their benefits by adjusting their capital structure before the real rating action taken by raters.

Delayed credit rating change, as the proxy of asymmetric information, has three crucial features in this study, which were not applied in the previous literature. Firstly, DCRC is considered as the asymmetric information before it takes place and thus its information effect is not that following the rating's announcement as used in the previous literature (Kliger and Sarig (2000), and Tang (2009)). Secondly, it is reasonable to assume timing of rating changes cannot be anticipated by outsiders since high frequency data is adopted for the tests in the research. Thirdly, it might not be exogenous as assumed in previous studies, but is more likely to be endogenous.

The specific characteristics of DCRC will be decisive on understanding its influence on issuer's financing. For example, the first feature of DCRC distincts its influence on the market from rating's effect found in the previous studies. Specifically, delayed rating upgrades are considered as bad news while delayed downgrades are generally good news to issuers. The third feature indicates that issuers and rating agencies have the potential to communicate and collaborate during the process of rating news disclosure and issuers may choose the technique to disclose their updated financial information to the market through rating agencies as well as their direct communication with the market.

Issuers weight the financing costs and benefits associated with credit rating changes to decide the debt-equity choice and to achieve better payoffs. Based on the features of DCRCs, the benefits of debt include the tax deductibility (Kraus and Litzenberger (1973)), reduction of agency problem through decreased free-cash-flow (Jensen and Meckling (1976), Jensen (1986), and Fama and French (2005)) and a relatively cheaper price for 'bad' issuers before downgrades. The costs of debt consist of the cost of financial distress (Scott (1976)), debt overhang (Myers (1977)), agency conflicts and that debt would be more costly for 'good' issuers before upgrades. The benefits of equity include more transparent communication with the market and keeping the firm's flexibility. The costs of equity are transaction costs and the adverse selection costs created by an issuer's superior information about the value of the firm's equity (Myers (1984)). The latter is mainly reflected as the significant price drop after its issuance on the market. The trade-off between debt and equity will finally lead to an issuer's financing decisions.

Issuers' considerations on deciding capital structure is mainly to adjust outsider's evaluation precision on their firm value through direct communications or indirect signalling (Ang and Cheng (2011)), or to decrease their financing costs, or to keep ratings at certain levels (Kisgen (2006)). 'Good' issuers may therefore intend to convey to the market their updated knowledge of their firms which is better than the market's expectation. In contrast, 'bad' issuers, who try to hold back bad news in order to avoid its negative impact on firm value, financing costs and capital accessibility (Kothari, Shu and Wysocki (2009)), would prefer to behave either like 'good' or 'others' issuer.

In short, the choice of debt and equity by 'good' and 'bad' issuers in response to DCRCs are expected to be significantly different. The 'good' issuers intend to keep ratings at a certain level and confirm the upgrade news being disclosed in the next period. This is due to the so-called 'credit passport' effect when many financial contracts link payment conditions to credit ratings. Policy makers also draft financial regulations by referring to credit ratings, giving rise to an endorsement value of ratings[14]. In contrast, the 'bad' issuers have financial incentives to take advantage of cheaper debts before downgrades. As analysed above, the 'good' issuers may take higher cost of debt but lower cost of equity. The higher cost of debt comes from the undervalued ratings, associated with which issuers have to pay more when they issue debt. 'Good' issuers' lower costs of equity are due to insignificant drops in equity price after equity issue announcement (Ang and Cheng (2011))[15]. The 'bad' issuers may face the opposite situations.

2.5 Financing , Governance and Performance

2.5.1 Corporate Governance

Corporate governance is an indispensable element linking corporate financing and firm performance. In fact, capital structure is employed as a corporate governance device, which preserves the governance efficiency and ensures the governance system creates firm value (La Rocca (2007)). The relevant study has increased dramatically during the last few decades. Understanding the concept of corporate governance helps researchers to gain an overall picture of a firm's internal and

[14] Sarbanes-Oxley Act sums up the benefits of keeping ratings at a level (U.S. Securities and Exchange Commission (2003)).
[15] The test results of price change in response to previous rating changes also show that significant price drop is only significant to 'bad' issuers but not 'good' issuers.

external functioning mechanism. However, as summarized in Gillan (2006), the definition of corporate governance differs depending on one's view of the financial world. Shleifer and Vishny (1997) define corporate governance as the approaches whereby suppliers of finance to the corporations assure themselves of getting a satisfactory return on their investment. Taking a broad perspective, Zingales (1998) views governance systems as the complex set of constraints that shape the ex post bargaining over the quasi-rents generated by a firm. Gillan and Starks (1998) define corporate governance as the system of laws, rules, and factors that control operations at a company. Irrespective of the particular definitions above, researchers often categorize corporate governance mechanisms into one of two groups: those internal to firms and those external to firms.

Figure 2.3 delicately captures the essence of the relationship between internal and external governances. The figure clearly illustrates one of the core issuers of firm performance management: how does a firm finance their business? The left-hand-side of the diagram comprises the basis of internal governance. The management, acting as shareholders' agents, decides in which assets to invest and how to finance those investments. The Board of Directors, at the apex of internal control systems, is charged with advising and monitoring management and has the responsibility to hire, fire and compensate the senior management team (Jensen (1993)). The right-hand side of the diagram introduces elements of external governance arising from a firm's need to raise capital. Further, it highlights that in publicly traded firms, a separation exists between capital providers and capital managers, which creates the demand for corporate governance structures. Combing

all the factors in the figure, managers finally make the decision on firm's financing strategy.

[Insert Figure 2.3 here]

2.5.2 Capital Structure and Firm Performance

An extensive literature is dedicated to study capital structure and its influence on corporate performance (See the surveys by Harris and Raviv (1991) and Myers (2001)). Margaritis and Psillaki (2010) point out that the relations between firm financing and firm governance are mainly addressed by agency problem, the conflicts of interest between owners-managers and shareholders as well as those between controlling and minority shareholders, which has been well documented in the corporate governance literature throughout the past few decades (for example, Berle and Means (1932), Jensen and Meckling (1976), Shleifer and Vishny (1986), and Berger and Bonaccorsi di Patti (2006)).

The importance of the agency cost is emphasized by the seminal paper Jensen and Meckling (1976) showing that the agency problem arises from the separation of ownership and control of firms. The agency problem theory is based on the assumption that the interests of the company's managers and its shareholders are not perfectly aligned: a manager, as the agent of the firm and its shareholders, tends to maximize their own utility rather than the value of the firm when managers have incentives to take excessive risks as part of risk shifting investment strategies.

To this end, Bhagat and Bolton (2008) summarise the reasons for the rise of interest conflict between managers and shareholders over financing policy. Firstly,

shareholders are much more diversified than managers who besides having stock and stock options on the firm have their human capital tied to the firm (Fama (1980)). Secondly, as suggested by Jensen (1986), a larger level of debt pre-commits the manager to work harder to generate and pay off the firm's cash flows to outside investors. Thirdly, Harris and Raviv (1988) and Stulz (1988) both argue that managers may increase leverage beyond the 'optimal capital structure' in order to increase the voting power of their equity stakes, and reduce the likelihood of a takeover and its resulting possible loss of job-tenure.

The free cash flow problem, noted by Jensen (1986) examining the US oil industry, comes from the incentives of a firm's manager to invest beyond the optimal size. Managers, whose compensation is positively related to the growth in sales (see, Murphy (1985)), may finance projects earning low returns with the consequence that the firm might not be funded by the equity or bond markets. Thus high debt ratios may be adopted as a disciplinary device to reduce managerial cash flow waste through the threat of liquidation, causing personal loss to managers in terms of salaries, reputation and perquisites (Grossman and Hart (1983) and Williams (1987)) or creating pressure to generate cash flows to service debt (Jensen (1986)). Furthermore, Ofek (1993) claims that the existence of debt in external financing may help to preserve a firm's going-concern value. Novaes and Zingales (1999) (in Bhagat and Bolton (2008)) suggest that the optimal choice of debt from the viewpoint of shareholders generally differs from manager's optimal choice. In these situations, debt is likely to affect the value of the firm positively.

Whereas debt may reduce the agency costs of outsider equity, on firm performance, debt has the opposite effect since agency costs can also appear due to

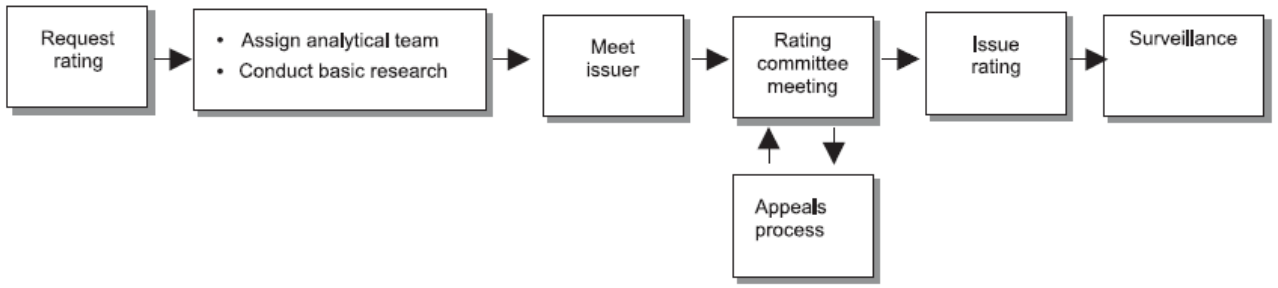
conflicts between debt holders and equity investors (shareholders), which may impart a negative effect on the value of the firm. Jensen (1989) and Ofek (1993) find that highly-leveraged firms will responds operationally and financially faster to a decline in firm performance than a less-leveraged firm since the former may face to default even if the decline is subtle. These conflicts arise when the leverage becomes relatively high and therefore induces a risk of default, which may create what Myers (1977) referred to as an 'underinvestment' or 'debt overhang' problem. Building on Myers (1977) and Jensen (1986), Stulz (1990) develops a model in which debt financing is shown to mitigate overinvestment problems but aggravate the underinvestment problem. Overall, the previous studies predict that debt will have both a positive and a negative effect on firm performance. This study expects the increase in leverage on firm performance to be positive.

Other literature about financing strategy and firm performance include DeAngelo and DeAngelo (1990), which report that 67% of firms suffering a decline in performance, profitability and cut dividends and it is further extended by Ofek (1993), which tests whether a firm's level of debt before performance decline is related to its dividend decision. Jensen (1989) and Wruck (1990) claim the link between firm leverage and performance through possible default and financial distress. They propose that firms, which are with the motivation of avoiding default, are forced to make crucial decisions earlier due to their increased debt levels impose discipline on a firm. Jensen (1989) argues that a more highly leveraged (MHL) firm responds faster to a decline in firm value than one which is less leveraged, 'because the value of a MHL firm can decrease less before it is forced into bankruptcy' (Altman (1971) in Whiting and Gilkison (2000)). Berger and

Bonaccorsi di Patti (2006) document that the choice of capital structure may help mitigate the agency costs.

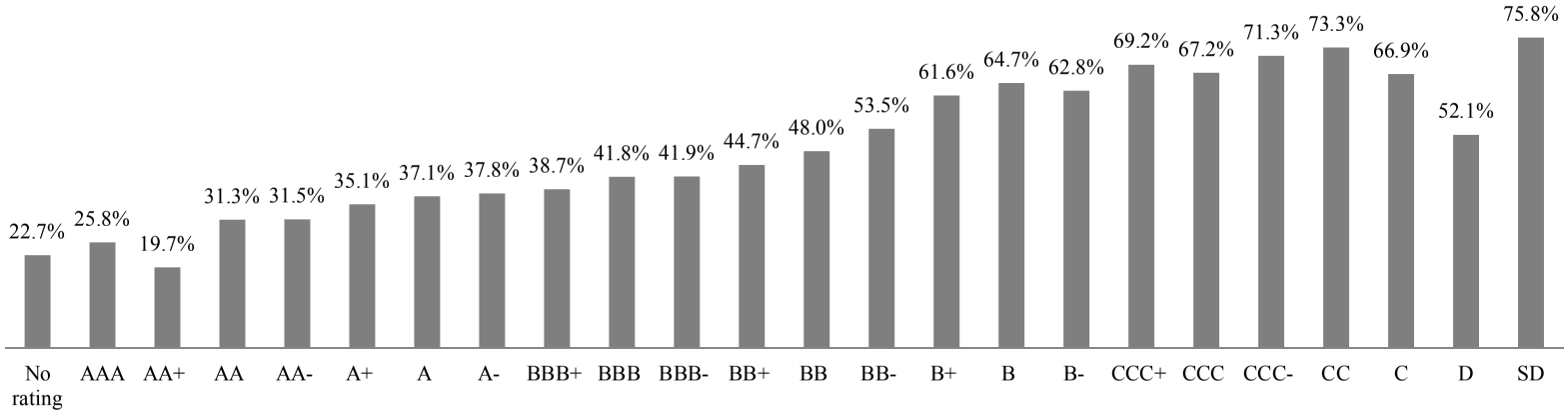
The literature adopts a number of various measures of firm performance from angles of different market participants, such as (1) financial ratios from balance sheet and income statements (e.g., Demsetz and Lehn (1985), Gorton and Rosen (1995), Mehran (1995), and Ang, Lauterbach and Schreiber (2002)), (2) earnings per share (e.g., Stickel (1992), Jain and Kini (1994), and Johnson, Ryan and Tian (2009)), and (3) Tobin's Q, which mixes market values with accounting values (e.g., Morck, Shleifer and Vishny (1988), McConnell and Servaes (1990), McConnell and Servaes (1995), Mehran (1995), Himmelberg, Hubbard and Palia (1999)). This thesis mainly measures firm performances by three indicators: return on assets (ROA), earnings per share (EPS) and Tobin's Q.

Figure 2.1 The Standard and Poor's rating process



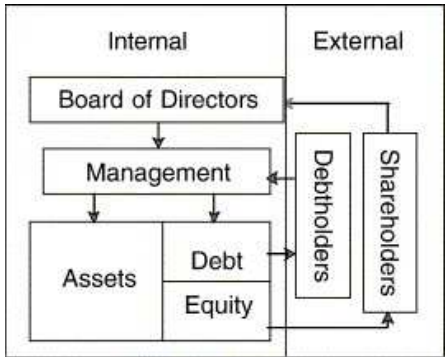
Source: Figure 3 in Crouhy, Galai and Mark (2001).

Figure 2.2 The average leverages by ratings



Source: Based on Compustat North America data and S&P rating data *Q1 1985 - Q4 2010* adopted in this study.

Figure 2.3 Corporate governance and the balance sheet model of firms



Source: Figure 1 in Gillan (2006), which adapts the figure from PowerPoint slides accompanying Ross, Westerfield and Jaffe (2005).

Table 2. 1 Selected bond rating agencies

Year Ratings First Published	Credit Rating Agency	Home Country	Year of SEC Designation	Ownership	Principal Ratings Areas
1909	Moody's Investors Service ('Moody's')	U S	1975	Dun & Bradstreet	Full Service
1922	Fitch Investors Service ('Fitch')	U S	1975	Independent	Full Service
1923	Standard and Poor's Corporation ('S&P')	U S	1975	McGraw-Hill	Full Service
1972	Canadian Bond Rating Services ('CBRS')	Canada	N/A	Independent	Full Service (Canada)
1974	Thomson Bank Watch ('Thom')	U S	1991	Thomson Company	Financial institutions
1975	Japanese Bond Rating Institute ('JBRI')	Japan	N/A	Japan Economic Journal	Full Service (Japan)
1977	Dominion Bond Rating Service ('DBRS')	Canada	N/A	Independent	Full Service (Canada)
1978	IBCA	U K	1990	Independent	Financial institutions
1980	Duff and Phelps Credit Rating ('Duff')	U S	1982	Duff and Phelps Corp	Full Service
1985	Japanese Credit Rating Agency ('JCRA')	Japan	N/A	Financial institutions	Full Service (Japan)
1985	Nippon Investor Service Inc ('NIS')	Japan	N/A	Financial institutions	Full Service (Japan)

Source: The credit rating industry (Cantor and Packer (1994)).

Chapter III

Delayed Credit Rating Changes, Information Asymmetry, and Firm Financing

3.1 Introduction

The importance of credit ratings is phenomenally prevalent in financial markets. This is not only because of the fact that ratings effectively provide an entry ticket for issuers to enter into the debt market (see, Dallas (1997), and Cantor and Mann (2007)), but also that changes in rating often lead to adjustments in security prices (Hand *et al.* (1992)), the financing costs of issuers as well as the existing credit and debt agreements of the firm. For instance, Kliger and Sarig (2000) show that firms' debt value increases (decreases) and equity value falls (rises) when Moody's announces better (worse) than expected ratings. In addition, policy makers often draft financial regulations with references to credit ratings, giving rise to an endorsement value of ratings[16]. Any information pointing toward a future change in rating for a firm, therefore, is crucial for the stakeholders of the firm, and hence may affect firm managers' financing decisions. Graham and Harvey (2001), for example, report that 57.1% of CFOs in the sample see credit ratings as the second highest concern when they determine firm capital structure.

This chapter contributes to the capital structure literature by investigating firms' financing activities *before* a change in rating is publicly revealed. It provides evidence on the ways by which firms adjust their debt and equity financing based on the asymmetric information of different anticipation on credit rating changes between insiders (the issuers) and outsiders (the market).

The study in this chapter is motivated by recent survey evidence and significant corporate events confirming that rating agencies do not change ratings in a timely

[16] The Sarbanes-Oxley Act sums up the benefits of keeping ratings at a certain level (U.S. Securities and Exchange Commission (2002)).

manner that reflects the up-to-date financial condition of a firm. This timeliness issue came under the public spotlight particularly surrounding the Enron, WorldCom and Lehman Brothers episodes. The Association for Financial Professionals (AFP) conducted a survey in 2002 that reported 'Most respondents do not believe changes in their company's finances are promptly reflected in the ratings'.[17]

The difference between the time when the information of the firm emerges internally, which is available only to firm managers but not to the public, and the revelation time for a change in rating by agencies, creates a window for information asymmetry. This is because the managers have first-hand information about the firm's financial circumstances, operating performance, growth opportunities and future prospects, while investors may not have easy access to such up-to-date information.

Further, in order to revise their assessment on the firm's credit quality, investors rely on publicly available information including the revelation of rating changes by rating agencies. Investors often receive only the information on the level of ratings, but not the fully specific details underlying rating agencies' decisions (Kliger and Sarig (2000)). In contrast, firm managers have a knowledge advantage about the firm, and based on their understandings about agencies' ratings criteria, they are able to predict rating changes for the firm in the near future with greater

[17] Empirical studies have offered some explanations for the observed delay in rating changes. Boot *et al.* (2006), among others, report that rating agencies may grant issuers time to recover before taking rating actions. Micu *et al.* (2006) provide evidence that rating agencies who pursue rating accuracy and stability to maintain their professional reputations do not revise credit ratings if the expected impact on credit quality of an event is considered as being temporary, uncertain or reversible.

precision than investors.[18] The voluntary corporate disclosures summarised by Healy and Palepu (2001) and the level of information asymmetry endogenously chosen by firms (Ang and Cheng (2011)) may also greatly improve issuers' predictions of future rating changes. An information asymmetry in expected future rating changes thus arises between investors and firm managers.

Such an information asymmetry may allow managers to exploit the advantages of their insider information on anticipated changes in credit ratings. One of the actions they may take is to undertake capital structure transactions. For example, Myers (2001), among others, describes how information asymmetry creates chances for 'financing tactics' and 'financing strategies'.

The study in this chapter considers the information asymmetry between corporate bond issuers and investors and investigates its influences on issuers' financing activities.[19] This research differs from previous research in its focus on the information asymmetry induced by the 'delayed' arrival of a change in rating during which firm managers may foresee the future rating based on their information advantages but investors may not. It analyses whether managers exploit such information asymmetry by making corporate financing adjustments. None of the extant literature has investigated this research question.

Prior studies have examined the influence of rating changes on the subsequent capital structure decisions in different contexts. An early study Diamond (1991)

[18] It is reasonable to assume that rating changes cannot be anticipated by outsiders since high frequency data is adopted in this research.

[19] Tang (2009) points out that empirical studies often use proxies of information asymmetry with corporate characteristics such as market-to-book ratio, tangibility and ownership as well as institutional analyst forecasts, but that these factors' explanatory power on corporate behaviors is weakened due to the high correlation between these variables and firms' unobservable investment opportunities.

starts a theoretical model analysing debt maturity structure given borrowers hold private information about their future credit rating. Kisgen (2006) defines firms being rated with either a plus or minus at the beginning of a financial year as near a change in rating, and documents that these firms are more conservative in raising extra debt in the year. Kisgen (2009) shows that firms reduce leverage only following rating downgrades, but not upgrades. Tang (2009) studies firms' financing and investment decisions following Moody's rating refinement in 1982, which is considered as an exogenous rating refinement event.

This study defines the *delayed credit ratings change* (DCRC, henceforth) as a change in rating (upgrade or downgrade) of a firm to be revealed by ratings agencies in the following quarter. It derives indicators for delayed rating change based on realised ratings in the next quarter as a proxy for insiders' expectation of ratings in the current quarter. The approach in the framework of this study, differs from Kisgen (2006), in assuming that firm managers can foresee such changes based on their superior knowledge about the firm, while investors cannot[20]. This study defines three types of issuers: (i) 'good' issuers who expect their ratings to be upgraded in the next quarter, (ii) 'bad' issuers who expect their ratings to be downgraded in the next quarter, and (iii) 'others' who do not expect rating changes in the next quarter, used as a baseline in the test.

The quarterly financial data of companies in North America and Standard & Poor's ratings data are collected from Compustat for the period between Q1 1985 and Q4 2010. The tests evaluating DCRC's effects on financing regress the current

[20] Pinches and Singleton (1978) create the term 'rate changing lag', which is defined as 'the difference between the time investor's actions signify their recognition of significant changes in the prospects of the firm (as evidenced by abnormal residuals) and the time the rating agency changes the firm's bond rating'. The 'delayed rating change' in this study focuses on the time gap between issuers' actions and agencies' rating changes.

debt issue and equity issue on the rating indicators of upgrades and downgrades in the next quarter as well as a set of conventional control variables of firms' financials.

The main finding of this chapter is that DCRCs significantly affect issuers' capital structure decisions at least one period before the rating change taking place. Adjusting financing before rating changes is consistent with the hypothesis that the financing adjustment is due to information asymmetry before rating announcements are made. It finds that 'good' issuers moderately increase equity issuance by 0.901% (as the percentage of total asset in the last period) while 'bad' issuers significantly increase debt issuance by 1.809%. As a result, issuers take significant actions in adjusting their net debt issue in response to expected rating downgrades in the near future, but do not do so in response to expected rating upgrades. Specifically, issuers increase net debt issuance by 1.065% when they anticipate downgrades in the next quarter, but not respond to future upgrades.[21] Moreover, 'good' issuers take actions of financing adjustment one quarter before rating changes, while 'bad' issuers do so at least two quarters before rating changes.

Secondly, the evidence shows that issuers respond differently when they face changes in various credit ratings. In response to changes in long-term rating, 'good' issuers moderately increase equity issue by 0.894% (as the percentage of total asset in the last period) while 'bad' issuers significantly increase debt issue by 2.406%. Issuers facing a downgrade in short-term rating seek to save the rating by decreasing long-term debt one quarter before DCRCs.

[21] This evidence shows that financial and utility firms do not change their financing mix accordingly. It is consistent with the notion that the capital structure of financial firms is substantially influenced by regulators.

Thirdly, the responses of firms to DCRCs vary across rating categories. In particular, speculative-grade issuers show greater responses than investment-grade firms in adjusting net debt issuance, and typically have a wider information gap between outsiders and themselves. Overall, the findings in this study suggest that firms make financing decisions *before* the anticipated rating changes in order to benefit from the information asymmetry of DCRCs.

The rest of the chapter is organized as follows. Section 3.2 discusses the assumptions and develops the hypotheses. Section 3.3 presents the data and methodology. Section 3.4 describes the results. Section 3.5 discusses and concludes.

3.2 Hypotheses Development

3.2.1 Assumptions

According to the discussion in Section 3.1, it is reasonable to set out the assumptions below, which are the bases of the tests in this chapter evaluating DCRC's influences on issuers' capital structure strategy:

(i) credit ratings contain pricing-relevant information on shares and bonds, and thus affect issuers' overall financing costs;

(ii) announcements of credit rating changes are delayed to at least one period after the change of issuers' financial conditions;

(iii) issuers and raters are assumed to have the same expectations on future rating changes[22], which helps issuers to predict future rating changes at least one period before DCRC is released to the public[23].

[22] Kliger and Sarig (2000) argue that instead of revealing information to public which might benefit competitors,

3.2.2 Hypotheses

As the mechanism and timeline in Figure 3.1 illustrates issuers may take action to exploit the asymmetric information driven by delayed rating changes. Consider the example of a firm that has recently acquired a valuable investment opportunity or has better than expected financial conditions: the current rating of the firm does not reflect its improved credit quality. Thus, a rating upgrade coming late would not benefit the firm before it is announced by the rating agency. In contrast, a firm which faces negative future prospects holds back unfavourable information from outsiders. The current rating of the firm may over value its credit quality. A delayed rating downgrade may grant opportunities for the firm to conduct financing at a relatively cheaper cost.

[Insert Figure 3.1 here]

All the three types of issuers ('good', 'bad' and 'others' defined in Section 3.1) face the delayed information arrival of a change in rating; hence the information asymmetry between them and their investors. This study expects that the actions in debt and equity issuances chosen to exploit the information asymmetry on DCRC are significantly different for different types of issuers. Issuers balance the associated costs and benefits of debt and equity to decide the financing choice.

issuers provide raters with detailed insider information during the rating process. Kisgen (2006) states, 'Rating agencies may receive significant company information that is not public'. The documented close information communication between issuers and raters support the assumption (iii). S&P 'may allow for an appeal if the issuer can provide new and significant information to support it' also supports the point that issuers and raters share the same information set as well as the same view of future rating changes.

[23] 'The manager's information advantage over outsider investors is large' Myers (2001). The study in this chapter assumes that issuers are able to predict their future rating change at least one period before it is announced given two conditions: they have their firm's quality and finance information earlier than outsiders and issuers can reach the rating criteria easily through rating agency's public website (eg. S&P lists their criteria on www.standardandpoors.com/CriteriaTOC).

For 'good' issuers, it is relatively more costly to go for debt financing before upgrades than to wait until the news of an upgrade is disclosed by the rator. Before rating changes, 'good' issuers give priority to securing the anticipated rating upgrade being realised at the earliest possible juncture, and significantly avoid increasing debt financing, which might trigger off negative influence on the arrival of upgrade. This is because many financial contracts link payment conditions to credit ratings (Micu *et al.* (2006)) (the so-called 'credit passport' effect). Debt financing becomes cheaper for 'good' issuers' after an upgrade is realized. Moreover, this is consistent with the survey evidence of Graham and Harvey (2001) that issuers only aim at 'soft' leverage targets. The Trade-off Theory suggesting firms target a rigid leverage ratio would not play an active role in 'good' issuers' financing strategy when the cost of debt outweighs other factors.

The benefits of equity include more transparent communication with the market and keeping firms' flexibility. From the view point of communication with the market, since rating upgrades usually take longer to occur than downgrades[24], 'good' issuers are more keen to convey to the market their firms' updated credit quality, which is better than the market's evaluation. Equity financing as a format of direct communication mitigates the information asymmetry. This is because investors cannot obtain insider information but can learn from insiders' observable actions (Koku (1995)). This leads to the first hypothesis in this chapter:

Hypothesis 3.1*: 'Good' issuers prefer to issue equity than debt before a credit ratings upgrade.*

[24] According to the AFP survey (2002), 57% of the respondents who represent companies that have experienced a rating upgrade report that upgrades took place six months after the improvement of their financials, while 73% of respondents believe that downgrades occur within six months after deteriorations in the company's financials.

The delayed downgrade, conversely, allows 'bad' issuers to take advantage of relatively cheaper debt before a downgrade. In general, debt financing benefits issuers by lowering the weighted average cost of capital (Lally (2004)). Ross (1977), Narayanan (1988) and Noe (1988) also document that firm's value is positively associated with debt-to-equity ratio. Myers (1984) suggests that firms borrow up to the triggering point of financial distress. The benefits of debt include the tax deductibility (Kraus and Litzenberger (1973)), reduction of agency problem through decreased free-cash-flow (Jensen and Meckling (1976), Jensen (1986) and Fama and French (2005)). The costs of debt include the cost of financial distress (Scott (1976)), debt overhang (Myers (1977)), and agency conflicts. Korteweg (2010) provides recent evidence for the net benefits to leverage. Specifically for 'bad' issuers, debt is cheaper before a downgrade is released; therefore taking advantage of cheap debt before downgrades is sensible.

Although equity financing has been considered relatively more flexible than debt financing, it may involve significant drops in the share price on issue announcements (Asquith and Mullins (1986)). Fama and French (2005) offer an explanation for such price drops based on adverse selection whereby investors are aware of information asymmetry and thus believe that a firm's stock is overvalued when the firm undertakes seasoned equity offerings. 'Bad' issuers tend to hold back the unfavourable information and communicate less with market, which thus may cause significant a fall in stock price when new issuances are announced. From the discussion above, the second hypothesis arrives:

Hypothesis 3.2*: 'Bad' issuers prefer to issue debt than equity before a credit ratings downgrade*.

Finally, combining the statement above about equity financing, 'good' issuers and 'bad' issuers can face different benefits and costs. 'Good' issuers can lower the cost of equity financing due to the insignificant drop of stock price after issue announcements (Ang and Cheng (2011)). 'Bad' issuers who intend to hold back information from the market, find if attempting to offer seasoned shares, that share prices are likely to go down (Brealey, Myers and Allen (2006, p. 492)). As a result they do not significantly increase equity financing before downgrades. This leads to the third hypothesis:

Hypothesis 3.3*: 'Good' issuers' stock price does not significantly drop down while 'bad' issuers' stock price drops significantly after equity financing.*

3.3 Data and Methodology

3.3.1 Empirical Design

It is assumed that issuers and rating agencies share and exchange information on firm financials and the likelihood of future rating changes.[25] In this study, news of a change in released by ratings agencies is always assumed to happen in the quarter *t+1*. The issuers' expectation about future ratings for firm *i* at period *t+1* is provided by $I_{i,t+1}$, which is defined as the dummy indicators of realized rating changes at time *t+1* according to the assumption (iii) that issuers share the same information set with rating agencies:

[25] Kliger and Sarig (2000) argue that instead of reveling information to public which might benefit competitors, issuers provide raters with detailed insider information during the rating process. Kisgen (2006) states 'Rating agencies may receive significant company information that is not public'. 'It is reasonable to believe that market players in closer touch with a firm and its business are those who possess better information about that firm and trade on it' (Bharath, Pasquariello and Wu (2009)).

$$I_{i,t+1}^{U} = \begin{cases} 1, & r_{i,t+1} > r_{i,t} \\ 0, & otherwise \end{cases} \quad (3.1a)$$

$$I_{i,t+1}^{D} = \begin{cases} 1, & r_{i,t+1} < r_{i,t} \\ 0, & otherwise \end{cases} \quad (3.1b)$$

where $r_{i,t}$ and $r_{i,t+1}$ are the ratings of the issuer *i* at quarters *t* and *t+1*, respectively. The dummy variable indicates 'good' issuers if $I_{i,t+1}^{U} = 1$, who expect their ratings to be upgraded in the next quarter. It indicates 'bad' issuers if $I_{i,t+1}^{D} = 1$, who expect their ratings to be downgraded in the next quarter. The dummy variables indicate 'others' who do not expect rating changes in the next quarter, used as a baseline in the test when both $I_{i,t+1}^{U}$ and $I_{i,t+1}^{D}$ are zero.

The information gaps between insiders' and outsiders' expectations of firm *i*'s next period rating change are defined as $\left(I_{i,t+1}^{U} - \hat{P}_{i,t+1}^{U}\right)$ and $\left(I_{i,t+1}^{D} - \hat{P}_{i,t+1}^{D}\right)$ for rating upgrades and downgrades respectively. $\hat{P}_{i,t+1}$, a probability, denotes an outsider's expectations which is the market's assessment about the probability of the rating change of firm *i* at time *t+1* based on the publicly available information at time *t*. $\hat{P}_{i,t+1}^{U}$ and $\hat{P}_{i,t+1}^{D}$ are the market's expected probabilities on future upgrades and downgrades of firm *i* at time *t+1*, respectively.

To investigate the impacts of the information gap between insiders and outsiders, in specific, the information asymmetry driven by DCRCs, the current security (debt or equity) issue is designed to regress against the information gaps in the next period and control firm level factors which may affect capital structure:

$$\Delta Issue_{i,t} = \sigma_0 + \sigma_1\left(I_{i,t+1}^{U} - \hat{P}_{i,t+1}^{U}\right) + \sigma_2\left(I_{i,t+1}^{D} - \hat{P}_{i,t+1}^{D}\right) + \boldsymbol{\sigma_c X_{i,t-1}} + \varepsilon_{i,t} \quad (3.2)$$

where $\Delta Issue_{i,t}$ is the financing adjustment indicator of firm i at time t. σ_1 and σ_2 indicate current-quarter capital structure adjustments in response to the information gaps between insiders and outsiders concerning next-quarter rating upgrades and downgrades, respectively. The vector $\boldsymbol{X_{i,t-1}}$ contains conventional control variables in the literature and the vector $\boldsymbol{\sigma_c}$ includes the coefficients on the control variables[26].

3.3.2 Data and Sample

Data is collected from quarterly firm financials and monthly Standard & Poor (S&P) rating data from Compustat North America, which comprises more than 30,000 active and inactive publicly listed firms in the U.S. and Canada. To prepare data for the empirical tests, quarterly rating change indicators are derived from monthly rating indicators to combine with the quarterly financial data. Since the newly created quarterly rating change dummies only consider whether there is a rating change taking place, rather than the number of rating changes during the quarter, values of *monthly* rating change indicators are summed up by quarters and the *quarterly* rating indicators are defined as '1' if the sum of the *monthly* value greater than 0, otherwise '0'. This indicates that the value of the *quarterly* rating dummy in the quarter is equal to '1' when rating changes take place in any month of the quarter, while it is equal to '0' when rating changes do not happen in any month of the quarter. The sample covers all firms with quarterly financial data and at least one rating record during the sample period: Q1 1985 (when the rating data begins in Compustat) to Q4 2010. The firm-quarter observations with negative equity (leverage greater than one) are excluded.

[26] The control variable vector $X_{i,t-1}$ is a *px1* vertical vector and the coefficient vector $\boldsymbol{\sigma_c}$ on $X_{i,t-1}$ is a *1xp* horizontal vector, which guarantees the dot multiplication between the control variable vector and its coefficient vector work. The rule applies in the rest of the equations in the thesis. (*p* denotes the number of elements of the vectors).

The final sample for empirical tests further excludes utility companies (SIC 4000-4999) and financial companies (SIC 6000-6999) as with conventional treatments[27]. Myers (2001) points out that these companies have a narrower menu of financing choices and cannot adjust their capital structures at a relatively low cost. In addition, regulations related to the disclosure policy of financial firms are usually stricter than non-financial firms, and hence reduce the advantage given by superior information of financial firms, which in turn, de-motivate firm's actions in financing adjustments. The tests for the sample of financial firms and utility firms are reported in Appendix 3 and Appendix 4 respectively, which show insignificant coefficient estimates on rating changes, and hence do not alter the overall conclusions of this chapter.

3.3.3 Dependent Variables

The study examines the effects on *debt issuance*, *equity issuance* and *net debt issuance* as the percentage of lagged total asset, which are defined as follows:

$\Delta det_{i,t} = \frac{\Delta D_{i,t}}{A_{i,t-1}}$: *debt issuance*, where $\Delta D_{i,t}$ is long-term debt issuance (Compustat DLTISY) [28] minus long-term debt reduction (Compustat DLTRY) plus changes in current debt (Compustat DLCCHY) for firm *i* in quarter *t*, and $A_{i,t-1}$ is total assets (Compustat ATQ) of firm *i* in quarter *t-1*.

[27] Ratings systems are usually applied to non-financial corporations, as special approaches are employed for banks and other financial institutions (Crouhy *et al.* (2001)).

[28] The last letter 'Y' in DLTISY indicates that the variable is year-to-date. All the other codes of variables which contain 'Y' as the end of the code mean the same. Quarterly values of observations for all variables comprised of year-to-date data are derived based on the year-to-date data.

$\Delta eqt_{i,t} = \frac{\Delta E_{i,t}}{A_{i,t-1}}$: *equity issuance*, where $\Delta E_{i,t}$ is the sale of common and preferred stock (Compustat SSTKY) minus purchases of common and preferred stock (Compustat PRSTKCY) for firm *i* in quarter *t*.

$\Delta net_{i,t} = \frac{\Delta D_{i,t} - \Delta E_{i,t}}{A_{i,t-1}}$: *net debt issuance* (as in Kisgen (2006)) is the difference between $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$.

A closer look into details of *debt issuance* and examination of the effects of short-term and long-term debt respectively, $\Delta det_{i,t}$ is broken down into $\Delta Sdet_{i,t}$ and $\Delta Ldet_{i,t}$:

$\Delta Sdet_{i,t} = \frac{\Delta SD_{i,t}}{A_{i,t-1}}$, where $\Delta SD_{i,t}$ is the change in current debt (Compustat DLCCHY) for firm *i* in quarter *t*.

$\Delta Ldet_{i,t} = \frac{\Delta LD_{i,t}}{A_{i,t-1}}$, where $\Delta LD_{i,t}$ is long-term debt issuance (Compustat DLTISY) minus long-term debt reduction (Compustat DLTRY) for firm *i* in quarter *t*.

3.3.4 Indicators for Upgrade and Downgrade

In order to indicate ratings upgrade and downgrade for firm *i* in quarter *t*+1, two sets of dummy variables are constructed. Each set consists of four dummy variables associated with the S&P ratings of long-term debt, short-term debt, subordinated debt and common stock. They are, respectively, Domestic Long-Term Issuer Credit Rating (Compustat SPLTICRM), Domestic Short-Term Issuer Credit Rating (SPSTICRM), Subordinated Debt Rating (SPSDRM) and Common Stock Ranking

(SPCSRM)[29].

$LTD^{U}_{i,t+1}, STD^{U}_{i,t+1}, SUB^{U}_{i,t+1}$ *and* $Equity^{U}_{i,t+1}$: dummy variables for ratings upgrade. They are equal to 1 if the individual ratings of SPLTICRM, SPSTICRM, SPSDRM and SPCSRM of firm *i*, respectively, are upgraded in quarter *t+1*.

$LTD^{D}_{i,t+1}, STD^{D}_{i,t+1}, SUB^{D}_{i,t+1}$ *and* $Equity^{D}_{i,t+1}$: dummy variables for ratings downgrade. They are equal to 1 if the individual ratings SPLTICRM, SPSTICRM, SPSDRM and SPCSRM of firm *i*, respectively, are downgraded in quarter *t+1*.

It is plausible that firm managers are not only concerned about a change in one of the above three ratings, but also about the overall outcome of the firm's future ratings due to the potential interacted changes among them (Crabbe and Post (1994)). The study thus further constructs two dummy variables to indicate the *overall* rating upgrade and downgrade[30].

$OR^{U}_{i,t+1}$= 1 if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing upgrade, and (ii) more individual ratings showing upgrade than downgrade.

[29] This indicator provides investors a predicted direction of future market risk. It provides 'investors with a measure of risk, a ranking change may signify a change in risk' (Felton, Liu and Hearth (1994)). However, it is not a rating for fixed income securities such as bonds. It thus has different features with the other three rating indicators. Therefore it is excluded from *overall* rating change indicators defined below but its individual influence on firm financing is reported with the other three rating indicators when testing individual rating effects.

[30] The long-term debt rating change takes more than 80% of the overall rating changes. The results of tests conducted in this chapter also show that long-term rating changes are the main factor that managers would consider when making financial adjustments.

$OR^{D}_{i,t+1} = 1$ if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing downgrade, and (ii) more individual  ratings showing downgrade than upgrade.

3.3.5 Control Variables

Control variables, conventionally considered in capital structure studies[31], include *Leverage, Size, Price, Liquidity, Profit, Dividends, Earnings, Growth, Tangibility* and *NDTS (non-debt tax shields)* to separate their influences from DCRCs on firms' financing decisions.

$Leverage_{i,t}$: ratio of the sum of short-term debt (*Sd*) (Compustat DLCQ) and long-term debt (*Ld*) (Compustat DLTTQ) to the sum of short-term debt, long-term debt, and stockholders' equity (Compust LSEQ minus LTQ) for firm *i* in quarter *t*.

 : logarithm of sales (Compustat SALEQ) for firm *i* in quarter *t*.

$Price_{i,t}$: logarithm of the quarterly close price in the quarter (Compustat PRCCQ) for firm *i* in quarter *t*.

$Liquidity_{i,t}$: ratio of cash and cash equivalent (Compustat CHEQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*[32].

[31] Kisgen (2006) shows significant negative relation between *Leverage* and debt issuance. Titman and Wessels (1988) show that firm *Size*, indicated by logarithm of sales, is one of the crucial determinants of capital structure. Marsh (1982) shows that changes in security *Prices* alter debt/equity ratios. Wald (1999), Myers (2001), and Fama and French (2002) demonstrate that *Profit* is an important factor that impacts capital structure. Market-to-book ratio (defined as *Growth* in this study) and *Tangibility* are variables affecting leverage ratio in Rajan and Zingales (1995). *Dividends* (Barclay, Smith and Watts (1995) and Titman and Wessels (1988)) and *Earnings* (Titman and Wessels (1988)) policy tightly relate to debt issuance and equity sale. *Liquidity* (see Kim, Mauer and Sherman (1998)) is included to control for possible impacts on leverage from firm's cash/liquidity positions and *NDTS* (*non-debt tax shields*), which is considered as an impact of optimal leverage level (DeAngelo and Masulis (1980) and Bradley, Jarrell and Kim (1984)) and may have negative influence on leverage.

[32] Cash flow can show a negative balance if firm have issued checks for more funds than it has in cash account, which would cause negative *Liquidity*.

$Profit_{i,t}$: ratio of EBITDA[33] to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Dividends_{i,t}$: ratio of cash dividends (Compustat DVY) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Earnings_{i,t}$: ratio of retained earnings (Compustat REQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Growth_{i,t}$: ratio of total debt book value plus quarterly close price (Compustat PRCCQ) multiplied by outstanding common stock shares (Compustat CSHOQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Tangibility_{i,t}$**:** ratio of property plant and equipment (Net) (Compustat PPENTQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$NDTS_{i,t}$**:** ratio of deferred taxes and investment tax credit (Compustat TXDITCQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

3.3.6 Regression Models

To simplify the regression (3.2), the assumption below is made and added to the assumption list in Section 3.2.1 as the assumption (iv): outsiders (the market) cannot forecast future rating changes. The assumption reflected in the mathematical equation as

$$\hat{P}^{U}_{i,t+1} = 0 \; and \; \hat{P}^{D}_{i,t+1} = 0 \quad \forall \; all \; i,t \tag{3.3}$$

Derive Equation (3.4) by substituting Equation (3.3) into Equation (3.2),

[33] $EBITDA_{i,t}$ is the earnings before interest, tax, depreciation and amortization for firm *i* at time *t*, which calculated as the sum of Pretax Income (Compustat PIQ), Inertest Expense (Compustat TIEQ) and Depreciation and Amortization (Compustat DPQ).

$$\Delta Issue_{i,t} = \sigma_0 + \sigma_1 I^U_{i,t+1} + \sigma_2 I^D_{i,t+1} + \boldsymbol{\sigma_c X_{i,t-1}} + \varepsilon_{i,t} \quad (3.4)$$

To investigate issuers behaviours around DCRCs, the study extends the regressions of security net issues normalised by total asset on rating changes and control variables in the quarters of *t-1, t, t+2, t+3* given that the rating changes take place in quarter *t+1*. The research does not list and explain the result at time *t+1* since it is difficult to distinguish the timing of financing adjustment and rating changes at the same quarter of rating changes. The test result thus may show imprecise information.

The model estimation starts by using the rating indicators based on overall rating indicators $OR^U_{i,t+1}$ and $OR^D_{i,t+1}$, respectively:

$$\Delta det_{i,t+\tau} = \beta_0 + \beta_1 OR^U_{i,t+1} + \beta_2 OR^D_{i,t+1} + \boldsymbol{\beta_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (3.5a)$$

$$\Delta eqt_{i,t+\tau} = \gamma_0 + \gamma_1 OR^U_{i,t+1} + \gamma_2 OR^D_{i,t+1} + \boldsymbol{\gamma_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (3.5b)$$

$$\Delta net_{i,t+\tau} = \alpha_0 + \alpha_1 OR^U_{i,t+1} + \alpha_2 OR^D_{i,t+1} + \boldsymbol{\alpha_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (3.5c)$$

$$\tau = (-1, 0, 2, 3)$$

where (β_1 and γ_1) and (β_2 and γ_2) are the responses of debt and equity adjustments to rating upgrades and downgrades in quarter *t+1*, respectively. For instance, β_1 means comparing with no rating change in the period of *t+1*, the adjustment of debt issuance as a percentage of total assets. These coefficients are the responses in capital structure adjustments at quarter $t+\tau$ (for two quarters before rating changes τ = *-1, 0*; for two quarters after rating changes τ = *2, 3*). The vector $\boldsymbol{X_{i,t+\tau-1}}$ contains the control variables.

According to *Hypothesis 3.1*, 'good' issuers prefer equity to debt financing before upgrades, and thus β_1 is expected to be insignificantly different from zero

while γ_1 is expected to be significantly positive when $\tau = 0$. In contrast, *Hypothesis 3.2* states that 'bad' issuers prefer debt to equity before DCRC to take advantage of overvalued debt, and hence predicts significantly positive β_1 and insignificant γ_2 when $\tau = 0$.

Next, substitute the rating indicators $I_{i,t+1}^{U}$ and $I_{i,t+1}^{D}$ with the four individual rating indicators:

$$\Delta det_{i,t+\tau} = \rho_0 + \rho_1 LTD_{i,t+1}^{U} + \rho_2 LTD_{i,t+1}^{D} + \rho_3 STD_{i,t+1}^{U} + \rho_4 STD_{i,t+1}^{D} + \rho_5 SUB_{i,t+1}^{U} + \rho_6 SUB_{i,t+1}^{D} + \rho_7 Equity_{i,t+1}^{U} + \rho_8 Equity_{i,t+1}^{D} + \boldsymbol{\rho_c X_{i,t+\tau-1}} + e_{i,t+\tau} \quad (3.6a)$$

$$\Delta eqt_{i,t+\tau} = \delta_0 + \delta_1 LTD_{i,t+1}^{U} + \delta_2 LTD_{i,t+1}^{D} + \delta_3 STD_{i,t+1}^{U} + \delta_4 STD_{i,t+1}^{D} + \delta_5 SUB_{i,t+1}^{U} + \delta_6 SUB_{i,t+1}^{D} + \delta_7 Equity_{i,t+1}^{U} + \delta_8 Equity_{i,t+1}^{D} + \boldsymbol{\delta_c X_{i,t+\tau-1}} + e_{i,t+\tau} \quad (3.6b)$$

$$\Delta net_{i,t+\tau} = \varphi_0 + \varphi_1 LTD_{i,t+1}^{U} + \varphi_2 LTD_{i,t+1}^{D} + \varphi_3 STD_{i,t+1}^{U} + \varphi_4 STD_{i,t+1}^{D} + \varphi_5 SUB_{i,t+1}^{U} + \varphi_6 SUB_{i,t+1}^{D} + \varphi_7 Equity_{i,t+1}^{U} + \varphi_8 Equity_{i,t+1}^{D} + \boldsymbol{\varphi_c X_{i,t+\tau-1}} + e_{i,t+\tau} \quad (3.6c)$$

$$\tau = (-1, 0, 2, 3)$$

where $\boldsymbol{X_{i,t+\tau-1}}$ is the control variable vector and the horizontal vectors $\boldsymbol{\rho_c}$, $\boldsymbol{\delta_c}$ and $\boldsymbol{\varphi_c}$ $(c = 9,10,\ldots,18)$ are the sets of coefficients on the control variables. As indicated in the equation, the capital structure adjustments happened at quarter $t+\tau$ (for two quarters before rating changes $\tau = -1, 0$; for two quarters after rating changes $\tau = 2, 3$), one period before the realised rating change announcements take places at quarter $t+1$.

The OLS is applied in the tests for the rest of this chapter since it gives a baseline result. Quarterly tests and individual industry tests do not show significant differences by time and industry. Various robustness checks and mixed estimation

are conducted in Chapter IV, whose results are in accordance with the assumption that no time and industry individual differences when issuers utilize DCRC as information asymmetry driven factor.

3.3.7 Summary Statistics

This study assumes that 'outsiders' (the market) cannot forecast future rating changes in quarter *t+1* based on publicly available information at time *t*. The data in the sample supports this assumption. There are 3267 *overall* rating upgrades and 5142 *overall* downgrades in the sample. Panel A of Figure 3.2, displaying the *overall* rating changes as a percentage of all observations in each quarter, shows that the percentages of overall upgrades and overall downgrades are very small in all four quarters. It is worth noting that the proportion of upgrades is generally smaller than the proportion of downgrades. Overall, 97.55% of the observations over four quarters are 'no rating changes'. 0.95% and 1.50% are upgrades and downgrades, respectively. This implies that by more than 97% of the time the market would be right to assume no change in credit ratings, and thus supports the rationality of the assumption (iv).

[Insert Figure 3.2 here]

The other three panels of Figure 3.2 show that the main feature of *overall* rating changes captures that of the long-term credit rating changes. On average, 97.77% of the observations of long-term credit rating changes over four quarters are 'no rating changes', while merely 0.81% of the observations are upgrades and 1.42% are downgrades. Upgrades and downgrades for the short-term credit rating are 0.13%

and 0.31% of the total observations, respectively, while those for the subordinate debt ratings are 0.19% and 0.18% correspondingly.

Panel A of Table 3.1 shows the summary statistics for the sample containing 343,096 firm-quarters. Firms on average issue more equity (normalized by total assets) of 0.033 than debt (normalized by total assets) of 0.01. The net debt issue is negative at -0.04. The short-term debt and long-term debt are on average both 0.005 but the former is more volatile (with the standard deviation of 1.292) than the latter (with the standard deviation of 0.405). Figure 3.3 plots the prevalent issuance of long-term debts, particularly in the decade of 2001-2010, illustrating the tendency of firms relying more on long-term debt than short-term debt financing over the years.

[Insert Table 3.1 and Figure 3.3 here]

The average firm has a *Leverage* ratio of 0.278, a *Size* of 3.660, a *Price* of 1.984 and a *Growth* (Market-to-Book ratio) of 2.229. Other control variables are all normalized by firms' total assets. The average firm holds 17.8% of its total asset value as cash and cash equivalent (short-term investments) and distributes 0.2% of its total asset value as dividends one quarter ahead of rating changes. Firms on average have negative *Profit* (-0.009) and negative retained *Earnings* (-1.642). The average firm holds approximately 28.6% of its book value of assets in fixed assets and has a ratio of 1.9% deferred taxes and investment tax credit to total assets.

Panel B of Table 3.1 reports the averages of the control variables by firm-quarter's debt and equity financing choices. The second column in the table presents the percentages of firm-quarter observations of the four financing methods

to total observations, showing that firms are more likely to use one form of financing and that equity issuance is much more frequently used than debt financing. This is in line with the sample of Fama and French (2005). Panel C of Table 3.1 reports the statistics of 'good' issuers and 'bad' issuers separately.

The control variables have the expected relationships with financing choices as identified in the literature. For example, the average firm size of 'debt only' issuers is the highest among all four financing groups, consistent with the notion that large companies tend to borrow more than small firms or that they simply have broader sources to borrow from (see, Myers (2001), and Frank and Goyal (2003)). Higher stock price motivates firms to issue equity, which is consistent with the Market Timing Theory (Baker and Wurgler (2002), and Dittmar and Thakor (2007)). Firms which have higher profitability prefer debt to equity as external funds, which is consistent with dynamic trade-off models (e.g. Fischer, Heinkel and Zechner (1989), Leland (1994) and Hovakimian, Opler and Titman (2001)). Firms that tend to pay dividends are larger firms that have easier access to public debt markets (Aivazian, Booth and Cleary (2006)). The result in Panel B also demonstrates that high growth firms tend to finance with equity (see, e.g. Myers (1984)). Companies with relatively safe and tangible assets tend to borrow more than companies with risky and intangible assets since intangible assets are more likely to sustain losses when faced with financial distress (see, Myers (1984), and Frank and Goyal (2003)).

Panel D of Table 3.1 presents correlations among control variables. None of the correlation coefficients in the matrix are greater than 0.65, which releases the pressure from the consideration of multicollinearity in the following tests. These relations are consistent with the expectations in literature.

3.3.8 Preliminary Evidence on Links between Leverage and Rating Changes

Figure 3.4 illustrates rating-leverage features throughout the sample. It plots the leverage ratios of firms according to rating change status, showing the average leverage ratio across all firms, the average leverage ratios of firms one quarter preceding their rating changes, and the average leverage ratios of firms in the quarter of their rating changes.

[Insert Figure 3.4 here]

Compared with the average leverage ratio of firms that experience rating changes, the average leverage ratio across all firms throughout the sample period is relatively low at 27.8%. The weighted average leverage ratios (WAL below in this paragraph) are both at around 46% two quarters before rating upgrades and downgrades. However, it is noticed that both WALs, round upgrades and downgrades, are 40% higher than the overall average leverage ratio. The WAL one quarter before rating upgrades goes down slightly to 45.4%, but in the one quarter before downgrades it goes up to 47.9%. In the quarter of rating changes announcements, the leverage of firms upgraded drops down further to 44.3% and that of downgraded firms moves in the opposite direction, climbing to 50.8%. The WAL of upgraded firms moves down 1% to 43.0% after the change and that of downgraded firms to 49.7%. However, the WALs of rating changed firms all increase significantly two quarters after rating change announcements. The reason for this could be that rating upgrades probably improve the funding raising environment for ‘good’ firms, while stock value decreases create high leverage for ‘bad’ firms, albeit this may not be the sole reason. This preliminary result shows the

evidence that delayed credit rating news does affect the issuer's leverage ratios, caused either by the adjustments of financing policy or change of debt-equity values. The formal tests are conducted in Section 3.4.

3.4 Results

3.4.1 Firm Financing Adjustments around Changes in Overall Ratings

The empirical analysis first examines whether firms significantly change net debt issuance one period before rating changes, as in equations (3.5a)-(3.5c). Panel B of Table 3.2 reports the regression results for one quarter before rating changes. Column 1 and 2 in the panel show that 'good' issuers issue more equity $\Delta eqt_{i,t}$ (the coefficient is 0.901% with a *t*-statistic of 2.57) than debt $\Delta det_{i,t}$ (the coefficient is 0.527% with a *t*-statistic of 1.78), in line with the prediction of *Hypothesis 3.1*. As with the prediction of *Hypothesis 3.2* for 'bad' issuers, the coefficient on $\Delta det_{i,t}$ is 1.809% (t = 7.76) and that on $\Delta eqt_{i,t}$ is 0.550% (t = 1.93), indicating that these issuers sharply increase debt issuance while equity is issued moderately. Column 3, Panel B of Table 3.2 shows the results of further examination of whether firms significantly change net debt issuance one period before rating changes. The results show that in response to an anticipated rating upgrade, issuers do not significantly change the net debt issue, indicating that 'good' issuers keep their net debt issue unchanged. In contrast, in response to an anticipated downgrade, issuers significantly increase net debt issue by around 1.065% (*t-statistic* = 1.96). This, again, indicates that 'bad' issuers embark on issuing more net debt before the rating downgrade.

[Insert Table 3.2 here]

Coefficient estimates on control variables, listed in Panel B of Table 3.2, are consistent with literature in both direction and statistical significance. For example, the negative coefficient -0.02733 (t = -9.71) on leverage indicates that *Leverage* in the previous quarter brings significantly negative effects on net debt issuance in the current quarter, i.e., firms with higher leverage issue less debt than equity. *Size*, an explicit measure of financial distress (Kisgen (2006)), is positively and significantly related to the net debt issue. Larger firms generally have fewer concerns about financial distress and can afford transaction costs and thus issue more debt. *Price* is negatively and significantly related to net debt issue, which is in line with the market timing theory, that issuers prefer equity to debt when *Price* is high. The net debt issue decreases 0.698% when the quarterly close price increases 1 unit. The negative coefficient (-0.01878) on *Liquidity* indicates that firms with cash and short-term investment opportunities choose equity issue rather than debt issue. Profitable firms have more internal financing available (Myers (2001)). *Profit* thus negatively correlates to external debt (-0.0031) and equity (-0.16245), resulting in the significant positive coefficient on net debt issue. *Retained earnings*, measuring the amount of internal fund, shows a positive and significant coefficient of 0.00087 on net debt issue. Firms with retained earnings tend to finance projects internally (Dittmar and Thakor (2007)). The positive coefficient on net debt issue is due to a more decreased level of equity issue (-0.00125) than that of debt issue (-0.00013). Firms holding valuable growth opportunities, as proxied by the market-to-book ratio in Rajan and Zingales (1995), tend to use a greater amount of equity finance than debt and so borrow less overall (Myers (1984), Barclay, Smith and Watts

(1995), Rajan and Zingales (1995) and Barclay and Smith (1999)). *Tangibility* is positively related to both debt and equity issues; in response to a 1 unit increase of *Tangibility* the increase range to debt issue is higher than that to equity issue, which results in its positive relation to net debt issuance. *NDTS* is negatively related to both debt (-0.02605) (DeAngelo and Masulis (1980), and Bradley, Jarrell and Kim (1984)) and equity issuances (-0.03018), but its influence on net debt issue is not significant. The credit rating change dummy variables provide additional explanatory potential beyond these control variable effects.

The analysis above is repeated and the test of debt-equity financing adjustment applied to the period of two quarters before the delayed rating changes. Column1 and 2, Panel A of Table 3.2 show the results when the dependant variables are debt issuance $\Delta det_{i,t+\tau}$ and equity issuance $\Delta eqt_{i,t+\tau}$ respectively. The coefficients β_1 and γ_1 signifying 'good' issuers' financing adjustments are both insignificant[34], indicating that they do not significantly change debt and equity financing in response to rating upgrades after two quarters. In contrast, in response to delayed downgrades, the coefficients β_2 and γ_2 are both significant[35] and the latter is more significant than the former, which suggest that 'bad' issuers intend to moderately use both debt and equity financing but rely slightly more on equity than debt. Column 3 of Panel A suggests that both 'good' and 'bad' issuers do not significantly adjust their net debt issuance two quarters before rating changes.

[34] As reported in Panel A of Table 3.2, β_1 is -0.00080 with a *t-statistic* of -0.17 and γ_1 is 0.00626 with a *t-statistic* of 1.10. The difference between the two coefficients is -0.00706 with a *t-statistic* of -0.95, which is not significant. It is in accordance with the significance of the estimation of α_1, the coefficient on net debt issuance.
[35] As reported in Panel A of Table 3.2, β_2 is 0.00760 with a *t-statistic* of 1.95 and γ_2 is 0.00987 with a *t-statistic* of 2.06. Although they are both significant, the difference between the two coefficients is -0.00227 with a *t-statistic* of -0.36 and thus is not significant.

Panel C and D of Table 3.2 show issuers' financing behaviours after rating changes are announced by rating agencies. In the first quarter after rating changes, 'good' issuers significantly increase debt issuance. 'Bad' issuers issue both debt and equity significantly at the 1% confidence level. In contrast with the continuing significant debt issuance, their equity issuance is significantly (*t-statistic*=2.51) amplified after downgrade compared with that in the quarter before downgrade (*t-statistic*=1.93). In the second quarter after rating changes, 'good' issuers issue less debt than in the last quarter but significantly increase equity issuance. 'Bad' issuers increase both debt and equity issuances, but on a lesser scale than those in the last quarter.

Summarizing the features of issuers' debt and equity financing shown in the four panels of Table 3.2, issuers behave differently throughout the four periods around DCRCs in response to upgrades and downgrades. 'Good' issuers start making financing adjustments one quarter before upgrades while 'bad' issuers do so two quarters before downgrades, though they only increase debt and equity issuances in low magnitudes two quarters in advance. Secondly, 'good' issuers significantly increase debt issuance only in the first quarter after rating upgrades while 'bad' issuers start doing so in the quarter before rating downgrades. Thirdly, 'good' issuers issue significant equity while 'bad' issuers do so at a significant level only in the quarters after DCRCs, which may be due to the higher cost of 'bad' issuers' equity issuance. This could be attributed to their significant stock price drop triggered by the equity announcement of firms with high information asymmetry, which is further confirmed in the test of *Hypothesis 3.3* conducted in Section 3.4.5.

The results imply that 'good' issuers issue equity one quarter before upgrades, which may be their way of communicating with the market. However, they could only enjoy cheaper cost of borrowing after rating upgrades (Tang (2009)). On the contrary, 'bad' issuers increase their debt issuance more significantly in quarter *t* than in quarter *t-1* but decrease equity issuance, which might be due to the relatively cheaper debt but more expensive equity in the quarter. Yet, 'bad' issuers seem to balance debt and equity financing after DCRC. This is derived from the coefficient on net debt issuance which is not significant at 1%. The evidence that 'bad' issuers' significant increase of equity issuance after downgrades in order to avoid significant increase of net debt issuance is documented in Kisgen (2009), which suggests that firms, trying to avoid further downgrade or to regain the previous rating, are more likely to increase equity financing but less likely to adopt debt financing.

'Bad' issuers still issue debt in the following two quarters after downgrades (consistent with the patterns in Tang (2009)), which may be due to issuers' debt maturity adjustment behaviour (Diamond (1991)), issuers' increased usage of various bonds simultaneously [36] or the change in investment policy or asset composition following downgrades (Rauh and Sufi (2010)). Further evidence about 'bad' issuers' behaviour is shown and discussed in the next section. [37]

3.4.2 Short-term Debt and Long-term Debt

[36] Rauh and Sufi (2010) argue that firms simultaneously increase dependence on both secured bank debt and subordinated bonds rather than switch from arm's length debt to bank debt when credit quality deteriorates. This is distinct from findings in previous literatures. This study does not consider debt heterogeneity in this research, thus do not investigate what type of debt 'bad' issuers would issue. However, Rauh and Sufi (2010) give the support on debt issue after credit-quality deteriorates.

[37] The results of balanced data are listed in Appendix 1 and 2, which shows the similar results with unbalanced dataset. It also indicates the robustness of the tests in the section.

Issuers may change debt structures when they face upgrades and downgrades (e.g., Rauh and Sufi (2010)). This section scrutinises the use of long-term debt and short-term debt financing to understand the way it is employed by issuers when they face rating changes. To this end, the dependent variable in the regression (3.5a) is substituted by the ratio of current period short-term debt issue to previous period total assets $\Delta Sdet_{i,t}$, and the ratio of current period long-term debt issue to previous period total assets $\Delta Ldet_{i,t}$. The regressions thus become:

$$\Delta Sdet_{i,t+\tau} = \beta_0^S + \beta_1^S OR_{i,t+1}^U + \beta_2^S OR_{i,t+1}^D + \boldsymbol{\beta_c^S X_{i,t+\tau-1}} + \varepsilon_{i,t} \quad (3.7a)$$

$$\Delta Ldet_{i,t+\tau} = \beta_0^L + \beta_1^L OR_{i,t+1}^U + \beta_2^L OR_{i,t+1}^D + \boldsymbol{\beta_c^L X_{i,t+\tau-1}} + \varepsilon_{i,t} \quad (3.7b)$$

$$\tau = \textit{(-1, 0, 2, 3)}$$

Panel B of Table 3.3 shows that both coefficients β_1^S in regression (3.7a) and β_1^L in regression (3.7b) are insignificant. The results indicate that 'good' issuers do not significantly issue either extra short-term or long-term debt before long-term credit rating upgrades. The coefficient estimate β_2^S in regression (3.7a) is statistically significantly positive at 0.00377 with *t-statistic* of 3.00 and the estimate of β_2^L in regression (3.7b) is 0.01725 with *t-statistic* of 10.30. These results indicate that 'bad' issuers issue both short-term and long-term debt before a downgrade in long-term credit rating, providing further evidence to support the *Hypothesis 3.2*.

[Insert Table 3.3 here]

As shown in Panel C of Table 3.3, the coefficient β_1^S in regression (3.7a) is 0.00301 with *t-statistic* of 1.82 while β_1^L in regression (3.7b) is 0.00435 with *t-statistic* of 2.11, indicating that 'good' issuers moderately issue both short-term debt and long-term debt after upgrade news is announced. In contrast, the coefficient β_2^S

in regression (3.7a) is statistically insignificant while β_2^L in regression (3.7b) is 0.02109 with *t-statistic* of 12.42, indicating that 'bad' issuers stop using short-term debt after announcements of downgrades but continue to rely on long-term debt.

Panel A and D of Table 3.3 show that only β_2^L in regression (3.7b) are both significant at 1% with *t-statistics* both at 5.29, indicating that 'bad' issuers issue long-term debt at the same significance level in two-quarter before rating downgrade and two-quarter after rating downgrade. None of the three coefficients on the other rating indicators, β_1^S and β_2^S in regression (3.7a) and β_1^L in regression (3.7b), is statistically significant. This suggests that 'good' issuers do not issue debt in any maturities and 'bad' issuers do not issue short-term debt in the two quarters.

The findings show that 'bad' issuers issue both short-term and long-term debt before long-term credit rating downgrades, however, the use of short-term debt ceases to exist after long-term rating downgrades, suggesting that 'bad' issuers take advantage of the overvalued short-term debt before downgrades. The significant drop in short-term debt issuance may be because 'bad' issuers lose access to short-term debt after downgrades (Rauh and Sufi (2010)) or due to a higher cost of short-term debt after downgrades. The possible reason of issuer's continued preference for long-term debt issuance is likely that it is cheaper than short-term debt (Brick and Ravid (1985)).[38] Issuers who issue long-term debt also imply that they are unwilling to refinance in the future. 'Bad' issuers with unfavourable private rating information are always willing to pay the rate on long-term debt to avoid the

[38] The model in Brick and Ravid (1985) suggests that 'the cost of capital and shareholder risk is lower with long-term financing than with short-term financing'. The chapter argues that 'tax benefit of financial leverage is accelerated and maximised with the use of long-term financing' 'when there is a gain from leverage and when the term structure of interest rates is upward sloping'.

expected costs of refinancing the debt (Berger, Espinosa Vega, Frame and Miller (2005)).

3.4.3 Firm Financing around Changes in Individual Ratings

Due to the diverse features of the four individual rating indicators[39], this section examines the effects of each of them. For instance, there are several differences in a firm's responses to short-term and long-term distresses (Ofek (1993)). Table 3.4 reports the results of the regressions (3.6a)-(3.6c) for the four quarters around DCRCs. Table 3.5 further shows the applications of short-term debt and long-term debt.

[Insert Table 3.4 and Table 3.5 here]

Among the four individual rating change indicators, S&P Domestic Long-Term Issuer Credit Rating seems to contribute most to the complex behaviours of issuers. It is assigned to rate issuers' or obligors' overall ability to repay its long-term debt obligations. Changes in delayed S&P Domestic Long-Term Issuer Credit Rating affect both debt and equity issuances as shown in the panels of Table 3.4. It significantly impacts on issuers' net debt issuance at the 1% level only one quarter before their announcements. The value for the coefficient ρ_1 of equation (3.6a) is insignificant, while ρ_2 is 2.205% with *t-statistic* of 8.36. This suggests that 'good' issuers do not significantly change debt issuance in response to next-quarter upgrades but 'bad' issuers increase debt issue before downgrade. δ_1 in equation (3.6b) has positive significance at 0.895% with *t-statistic* of 2.30 while δ_2 is insignificant. The result implies that 'good' issuers prefer equity to debt financing

[39] The S&P common stock ranking, which is not involved in deriving *overall* rating changes, is introduced here and its change has been tested in this section.

while 'bad' issuers prefer debt to equity. This is consistent with the implications of the influences of rating indicators overall, and thus are in accordance with *Hypothesis 3.1* and *3.2*. Panel B of Table 3.5 shows that 'bad' issuers use both short-term debt and long-term debt one quarter before downgrade, which is significantly distinguished from their sole usage of long-term debt two quarters before downgrade.

Panel C of Table 3.4 lists the results in the first quarter after DCRCs. The insignificant ρ_1 and δ_1 and the significant ρ_2 and δ_2 in the panel indicate that 'good' issuers do not adjust their financing, while 'bad' issuers continue issue debt and significantly start issuing equity at 5% in the first quarter after delayed changes in long-term credit ratings. Observing Panel C of Table 3.4 and 3.5 together, the estimates of coefficients indicate that 'good' issuers adopt short-term debt[40] while 'bad' issuers stop increasing short-term debt issuance, only increasing long-term debt in this period. In the next quarter, the significant ρ_2 and δ_1 suggest that 'good' issuers start to increase equity and 'bad' issues continue significant long-term debt issuance and equity issuance, however, the latter is only significant at the 10% confidence level.

Combining the results in the four quarters around changes in S&P Domestic Long-Term Issuer Credit Rating, the most crucial feature of 'good' issuers' behaviour is the sudden increase of equity issuance before the delayed upgrades and the temporary increase of short-term debt issuance after upgrades. The most significant characteristic of 'bad' issuers is the temporary increase of short-term

[40] This is not consistent with the impacts of overall rating in the same period. In the test for overall rating changes, 'good' issuers mainly increase long-term debt after upgrades, rather than short-term debt in the test for S&P Domestic Long-Term Issuer Credit Rating. It is very likely driven by the significant increase of long-term debt after subordinated debt rating upgrades.

debt financing before the delayed downgrades and continued usage of long-term debt in the quarters around downgrades.

Short-term credit ratings are generally assigned to short-term (less than one year) obligations in the relevant market (Chapman (2006)) [41]. Since short-term obligations are generally offered by large corporations with the highest credit quality, any downgrades could cause serious problems (Stojanovic and Vaughan (1998)) such as significant negative stock returns and leading investors to a more negative assessment of firms' future cash flows (Nayar and Rozeff (1994)). The rating also reflects firms' reputation for selecting safe investments. Changes in short-term credit ratings almost always lead to changes in long-term bond ratings, but the reverse is not true (Crabbe and Post (1994)). S&P's ratings definitions in (2011) officially point out that they are used to indicate the creditworthiness of an obligor with respect to long-term obligations.

The evidence of the test results shows that changes in delayed S&P Domestic Short-Term Issuer Credit Rating only affect debt issuance but not equity issuance. In addition, its influence on debt issuance only exists in the quarter before DCRC and is only significant for 'bad' issuers. ρ_4 is -1.378% with a *t-statistic* of -2.74, suggests that 'bad' issuers decrease debt issuance one quarter before downgrade. Panel B of Table 3.5 shows that 'bad' issuers mainly decrease long-term debt before downgrades. This could be caused by their intention to avoid the downgrade in short-term credit rating and to avoid investors' upward revision of the probability

[41] S&P considers the short-term obligations mainly as commercial paper and line of credit. This study mainly focuses on non-financial firms, thus exclude financial firms, such as banks. S&P short-term credit rating in the data sample thus is mainly assigned to commercial paper.

of bankruptcy when the amount of long-term debt is higher (Nayar and Rozeff (1994)).

S&P Subordinated Debt Rating Compustat data is only available until 1st September 1998, before which S&P adopted their previous rating method to rate particular type of debt. Generally riskier than senior debt, subordinated debt could be an indirect market proxy for issuers' riskiness (Blum (2002)). Evidence shows that changes in anticipated S&P Subordinated Debt Rating positively affect both 'good' and 'bad' issuers on their debt issuances but not equity issuances and the effect only exists one quarter before DCRC. ρ_5 in equation (3.6a) is 2.837% with a *t-statistic* of 3.93 and ρ_6 is 2.139% with a *t-statistic* of 2.93. Panel B of Table 3.5 shows that the significant financing adjustment is mainly due to the increase on long-term debt issuance. The evidence shows that the issuers' behaviours in response to delayed changes in S&P Subordinated Debt Rating are quite puzzling when considering the results in the four panels of Table 3.5 jointly.

S&P Common Stock Ranking, commonly referred to as Quality Ranking, reflects the long-term growth and stability of a company's earnings and dividends (Santicchia (2005)) and thus is widely used as a measure of market risk. Changes in S&P Common Stock Ranking, which is not integrated into overall rating change dummies in this study, show significant impacts on both debt and equity financing around DCRCs. Its influences on debt issuances are significant at the 1% confidence level only one quarter before DCRC as shown in the panels of Table 3.4. δ_7 is insignificant while δ_8 is negatively significant with *t-statistic* of -2.76, which suggests that 'bad' issuers, differ from 'good' issuers, tend to sell shares at a higher price before downgrades. This is likely to be due to the movement of the market

value of equity with S&P's quality rankings, which is almost monotonic (Chung (2000)). The coefficients on $Equity^{U}_{i,t+1}$ and $Equity^{D}_{i,t+1}$ are reported in the panels of Table 3.5 when debt issuance is broken down into short-term debt and long-term debt issuances. The results show that 'good' issuers start decreasing long-term debt issue two quarters before DCRC while slightly increasing long-term debt one quarter after upgrade. This may be due to 'good' issuers' improved financial conditions and the intention of refinancing after upgrade. 'Bad' issuers temporarily decrease short-term debt issuance one quarter before downgrade but stop adjusting it after the downgrade. In the meanwhile, they start decreasing long-term debt and this, however, lasts till at least two quarters after the downgrade. The decrease of long-term issue around downgrades is likely to be caused by issuers' motivation to allay investors' concerns about the probability of bankruptcy.

In summary, the result in this section shows that issuers respond to individual rating indicators in various ways variously due to the ratings' different characteristics. S&P Domestic Short-Term Issuer Credit Rating and S&P Subordinated Debt Rating do not further trigger issuers' financing adjustments after DCRCs. However, the S&P Domestic Long-Term Issuer Credit Rating further motivates 'bad' issuers to issue both debt and equity but not 'good' issuers. 'Bad' issuers tend to decrease debt issue after S&P Common Stock Ranking downgrade, and both 'good' and 'bad' issuers moderately decrease equity issues after its upgrades. The results in the two periods show that S&P Domestic Long-term Debt Rating is the main factor representing *overall* rating changes, which means that long-term obligation is the main aspect that managers would consider when making

the financing adjustment decisions. The coefficients on control variables are very similar to those of regressions (3.5a) - (3.5c) reported in the section 3.4.1.

3.4.4 Investment-Grade Firms and Speculative-Grade Firms

The tests for two rating subsamples, S&P investment-grade firms (above BBB inclusive) and S&P speculative-grade firms (below BBB), are conducted in this section to examine whether firms in the two groups have different sensitivities to DCRCs. Panel A of Table 3.6 reports the DCRCs' effect on security issues one quarter before DCRCs for the two subsamples[42]. The two subsamples are divided according to the indicator of S&P Domestic Long-term debt rating at time *t+1* (the quarter rating changes are announced). The investment-grade firms, regardless of 'good' or 'bad' issuers, do not adjust their net debt issuance $\Delta net_{i,t}$ one quarter before rating changes. The speculative-grade firms do not significantly adjust net debt issuance in response to future upgrades but increase net debt issuance by 1.133% (t= 2.24) in the face of an anticipated future downgrades.

[Insert Table 3.6 here]

The coefficients on debt issuance $\Delta det_{i,t}$ share the same features in the two sub-groups: 'Good' issuers do not significantly issue debt (coefficients for both are not significant at the 1% level) while 'bad' issuers issue more debt one period before downgrades. 'Bad' issuers in the investment-grade group increase debt issuance by 0.860% while those in the speculative-grade group increase debt issue by 1.527%. The coefficients on equity issuance $\Delta eqt_{i,t}$ vary. For the investment-

[42] The rating grades information is available on S&P's website: http://www.standardandpoors.com/ratings/definitions-and-faqs/en/us.

grade group, the coefficients on upgrades and downgrades are 0.896% and 0.944% respectively and are both significant at the 10% level, indicating that both higher-rated 'good' and 'bad' issuers issue small amounts of equity before DCRCs. For the speculative-grade group, the coefficient on upgrade is 0.512% and significant with a *t-statistic* of 3.27 but that on downgrade is not significant. This result suggests that lower-rated 'good' issuers increase equity issue by 0.512%, while lower-rated 'bad' issuers do not appear to adjust equity issue before rating downgrades.

Compared with investment-grade issuers, the more significant financing adjustment of speculative-grade issuers may be due to the greater information gap between lower-rated issuers and outsiders than the gap between higher-rated issuers and outsiders. Graham and Harvey's (2001) survey finds that speculative firms prefer to send a positive signal via equity issuance. 'Good' issuers in the speculative-grade group may signal their positive prospects with equity issue. Also, the issue of liquidity is more pronounced severe in speculative-grade firms than that in investment-grade firms, suggesting that the former would be more concerned by rating change effects than the latter (Kisgen (2006)). In summary, DCRCs' heavier impacts on speculative-grade issuers' financing indicate that they are considered more crucial by lower-rated issuers than by higher-rated issuers.

3.4.5 Price Responses to Debt-Equity Financing Adjustment

Some early studies found the evidence that the stock price reacts negatively to the announcements of equity issues. For example, some early studies show that announcements of seasoned issues of common stock generally result in stock price declines (Asquith and Mullins (1986)) and immediately reveal issuers' pessimism.

Earnings per share may be diluted and recent stock prices may drop when issuing equity (Graham and Harvey (2001)). Pushing the issue of debt-equity adjustment before DCRCs further, one of the benefits of equity financing as mentioned in the literature is that equity price only drops where the information asymmetry is great (Dierkens (1991)). This means that 'good' issuers may not wait after their future rating upgrades due to their consistent price around rating change periods. However, the evidence is not as obvious as the benefits of debt financing. To show the evidence of 'good' issuers' lower cost when they issue equity, the regression (3.8) is run to test the price responses to the financing adjustments at and after the periods when rating changes take places. It tests *Hypothesis 3.3* and examines the price reaction to equity issue announcements in three periods (in the period of rating changes and two periods after rating changes) to show evidence of 'good' issuers' lower cost when they issue equity.

$$\Delta price_{i,t+\tau} = \theta_0 + \theta_1 OR^U_{i,t+1} + \theta_2 OR^D_{i,t+1} + \boldsymbol{\theta_c X_{i,t+\tau-1}} + \varepsilon_{i,t} \quad (3.8)$$

(τ =1,2,3)

where $\Delta price_{i,t+\tau} = Price_{i,t+\tau} - Price_{i,t+\tau-1}$. It is the *Price* change between the period $t+\tau$ and $t+\tau-1$ for firm *i*, where Price is defined as the logarithm of the close price in Section 3.3.5. All the other variables in this equation are kept the same with those in the previous tests using *overall* rating change indicators. *Hypothesis 3.3* predicts that θ_1 is insignificant and θ_2 is significant and negative. Table 3.7 shows the results.

[Insert Table 3.7 here]

Firstly, the coefficient θ_1 is not significant while the estimate of θ_2 is 7.925% and significant at the 1% level in the quarter of rating changes, suggesting 'good' issuers' stock prices do not drop while 'bad' issuers' prices drop right after the rating downgrades. Secondly, the regression results are consistent in the three periods. The coefficients are negative but insignificant in response to upgrades while coefficients are all statistically significantly negative at the 1% confidence level. The result suggests that 'good' issuers' stock prices do not drop significantly while 'bad' issuers' stock prices continuously and significantly drop after three quarters after the rating changes. In addition, the coefficients of rating downgrades are -0.07925, -0.02669 and -0.01418 in the three periods respectively and are all significant at the 1% level, suggesting the extents of 'bad' issuers' price drops are decreasing. The results are robust when control the sample as the firm-quarter which has a positive equity issue one period before the rating change announcements[43].

The results strongly support *Hypothesis 3.3*. This is also consistent with studies from the literature, for instance, Ang and Cheng (2011) verify that 'firms with high information asymmetry suffer from negative market revaluation'. Moreover, *Hypothesis 3.3* further confirms *Hypothesis 3.1* and 3.*2* that 'good' firms prefer equity while 'bad' firms prefer debt when information asymmetry exists since a firm is more likely to issue equity if the cost of producing information is lower (Fulghieri and Lukin (2001)).

[43] When the test sample is filtered by excluding observations which do not have equity issuance in the quarter before rating changes, the stock prices of 'good' issuers do not drop significantly in the following three quarters after equity issuance and rating upgrades. The prices of 'bad' issuers drop significantly at 1% confidence level in the first quarter *(τ =1)* and at 10% confidence level in the second quarter *(τ =2)*. Comprehensive results of this test sample are available on request.

3.5 Discussion and Conclusion

This study proposes newly driven source of information asymmetry and its mechanism of affecting firms' financing. This chapter investigates the impact of the delayed arrival of credit rating changes, creating information asymmetry between insiders and investors, on the change in financing of corporate bond issuers. It is assumed that both issuers and rating agencies are insiders, whose knowledge and predictions on next-period rating change announcements are more precise than outsiders. They know firm's future rating changes earlier and more precisely than outsiders, especially investors and other market participants. This superior information may allow issuers to adjust their financing before the news of rating changes appears. The results from analysing companies in North America and S&P's ratings for the period between Q1 1985 and Q4 2010 suggest that firms take advantage of this information asymmetry and change capital structure in many ways.

Two types of issuers show different behaviours when facing delayed rating changes. 'Good' issuers convey their currently underestimated ratings and financial situation through issuing extra shares within a reasonable range. Most importantly, they tend to confirm upgrades in the next period by not significantly using debt financing. 'Bad' issuers try to hold back news of future rating downgrades by issuing debt and issuing moderate equity.

The result supports the prediction that the information gap between issuers and outsiders driven by DCRCs contains value, and affects issuers' capital structure in many aspects. Firstly, firms change leverage ratios one-quarter before rating changes. Secondly, firms' anticipated rating level affects their reactions to DCRCs.

Thirdly, not all types of rating indicators function on issuers' financing choices. S&P Domestic Long-term debt rating shows the most significant influence among the four S&P rating indicators. Fourthly, speculative-grade issuers will generally sustain greater impacts by DCRCs than investment-grade issuers.

The newly considered driving force of asymmetric information, via the delay in rating changes on issuers' financing adjustment behaviour before DCRCs, enriches our understanding of firms' financing decisions and the material effects of information asymmetry. The results hold when controlling the conventional leverage factors.

Figure 3.1 The timeline of issuers' financing actions before rating changes

The graph displays the timeline and the uncertainty of the actions of issuers and market and thus indicates the transmission mechanism. The rating changes take place at Time *t+1*.

Timeline

Time *t-1*	**Time *t***	**Time *t+1***
No significant financing adjustment	**Debt-Equity financing adjustment**	**Rating changes take place**
Rating change types (Upgrade or Downgrade) revealed to insiders (issuers), who have private information about their firms' prospects.	Insiders start to adjust their financing by utilising their private information. 'Good' issuers and 'bad' issuers have significantly different financing preference.	Firms' credit ratings are upgraded, downgraded or remain the same in this time period.

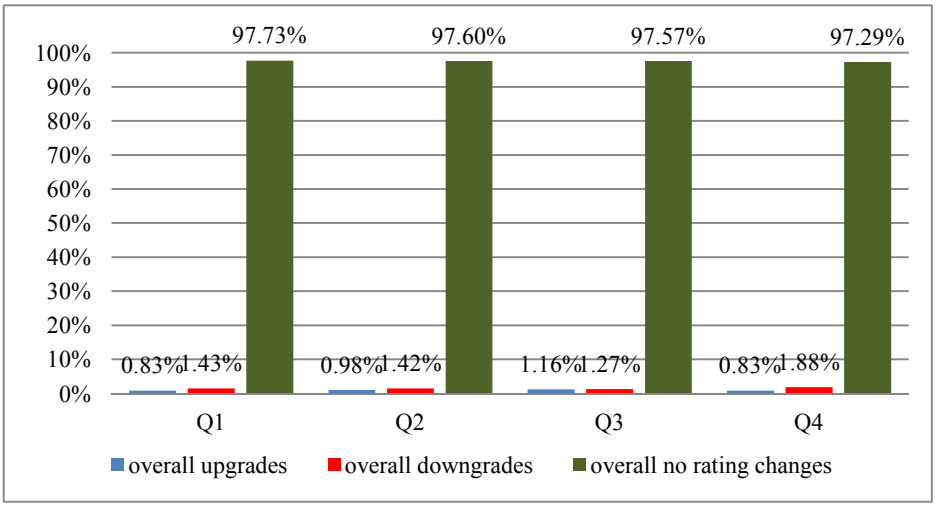
Issuer's benefit and cost of financing adjustment before *Time t+1*

'Good' issuer	Debt	Cost	Higher coupon rate; cheaper after upgrade realized
		Benefit	
	Equity	Cost	Little due to its consistent equity price before and after rating changes
		Benefit	Transparent communicate with the market and keep firms' flexibility
'Bad' issuer	Debt	Cost	Cheaper coupon rate; higher after downgrade realized; Financial distress; Debt overhang
		Benefit	Tax deductibility
	Equity	Cost	Equity price drop
		Benefit	Flexible than debt financing

Figure 3.2 Rating changes summarized by quarters *Q1 1985 --- Q4 2010*

This figure depicts the three types of rating changes (upgrades, downgrades and no rating changes) as a percentage of all observations in each quarter throughout the data sample Q1 1985 to Q4 2010. The blue columns represent the percentages of rating upgrades. The red columns represent the percentages of downgrades. The green columns represent the percentages of no rating changes. The four panels present the overall rating indicator, long-term credit rating indicator (LTD), short-term credit rating indicator (STD) and subordinate debt rating indicator (SUB), respectively.

Panel A Statistics of the overall rating indicator



Panel B Statistics of the long-term credit rating indicator

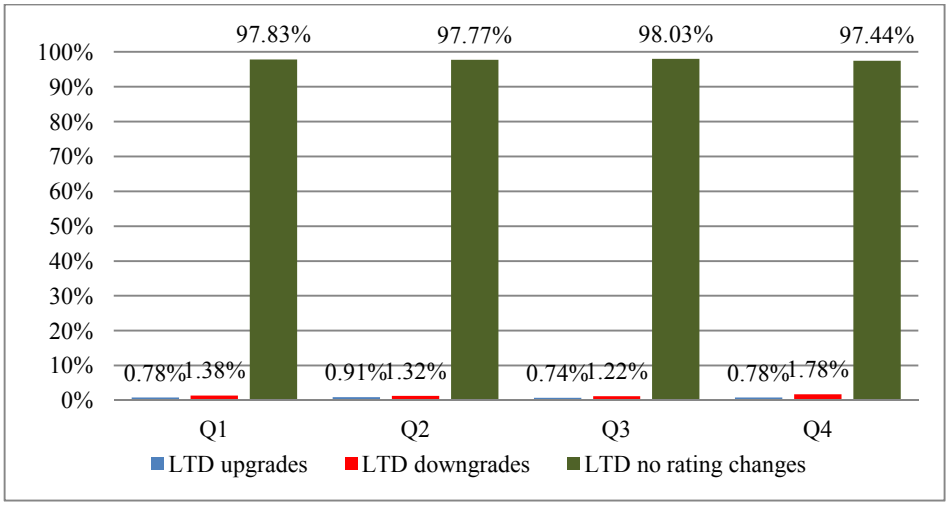
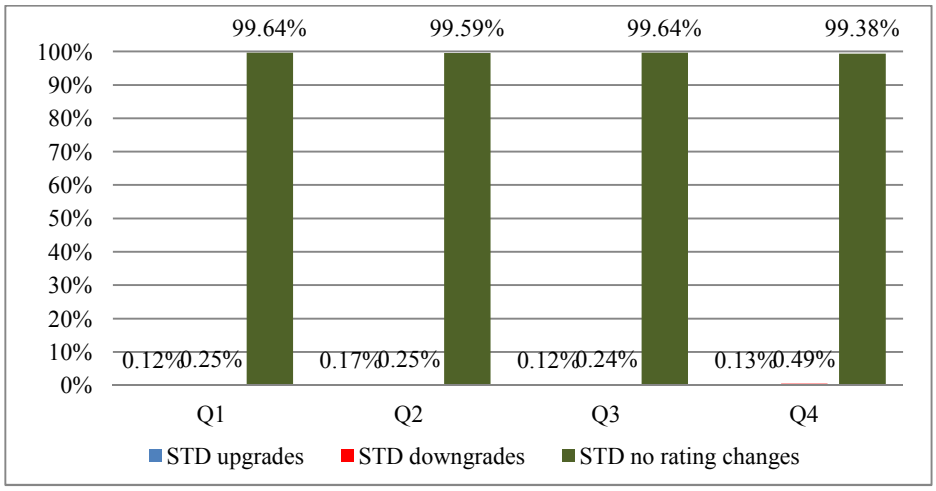


Figure 3.2 *(continued)*

Panel C Statistics of the short-term credit rating indicator



Panel D Statistics of the subordinate debt rating indicator

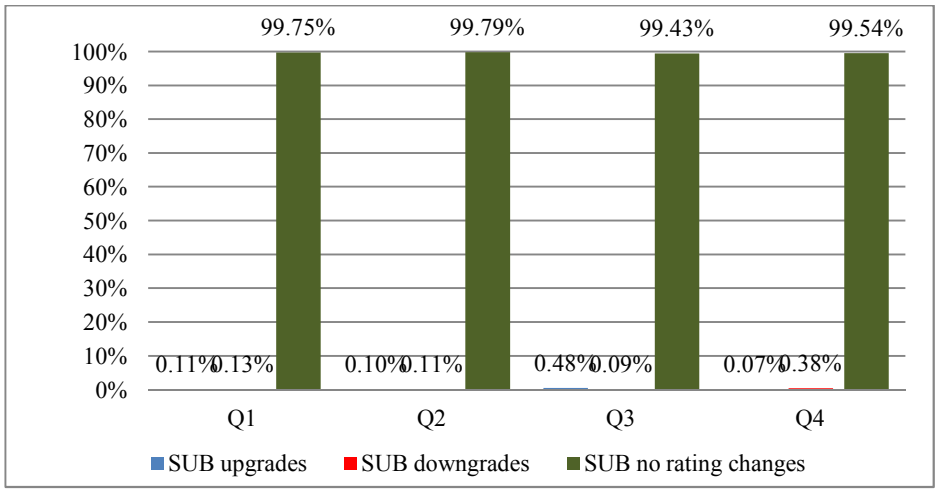


Figure 3.3 Short-term debt and long-term debt issuance by years *1985 --- 2010*

This figure depicts the values of short-term debt and long-term debt issuance as the percentages of total debt issuance throughout the data sample 1985 to 2010.

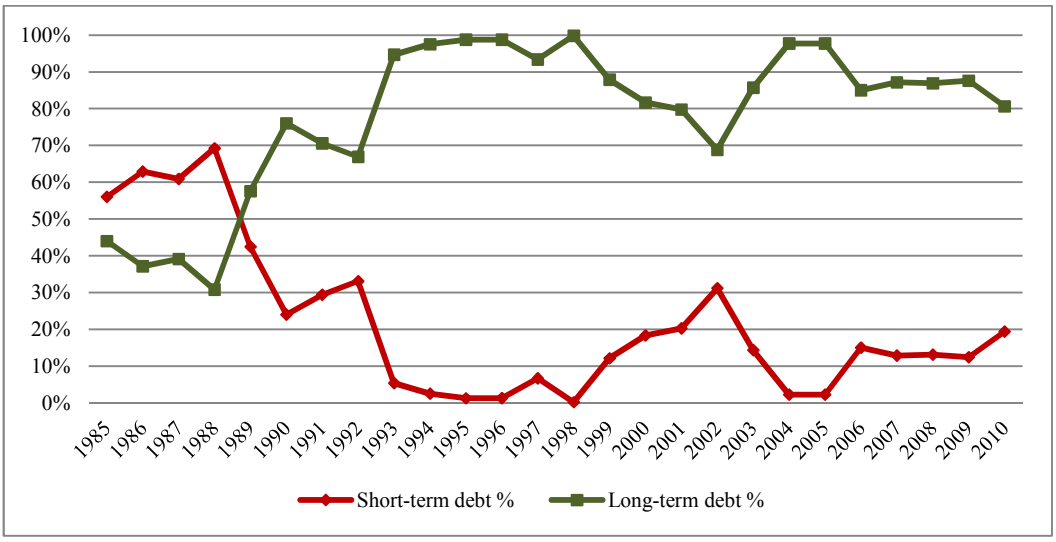


Figure 3.4 Sample statistics---Ratings and average leverage relations *Q1 1985 --- Q4 2010*

This figure shows the rating-leverage features throughout the periods around rating change announcements. Rating change takes place at time *t+1*. The blue columns represent the average leverage ratio throughout the whole sample. The green columns are the leverage ratios around rating upgrade periods. The red columns are the leverage ratios around rating downgrade periods.

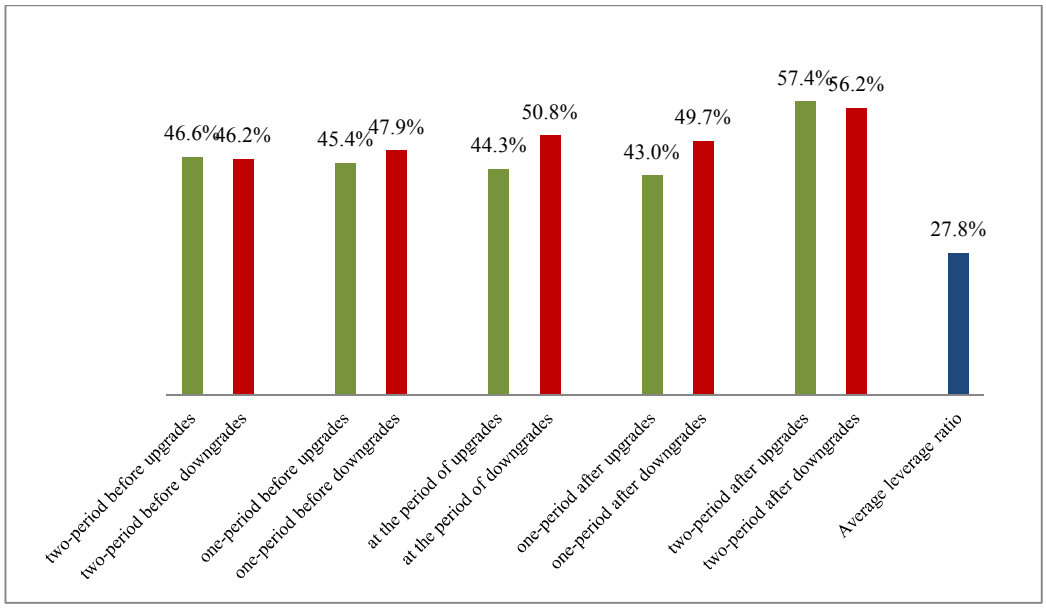


Table 3. 1 Sample summary statistics

The sample is drawn from quarterly Compustat data, excluding financial firms and utility firms and firm-quarters with negative equity values during the period Q1 1985 - Q4 2010. The statistics is based on the estimation samples of tests. Panel A lists summary statistics of dependant variables and control variables in the tests. Δdet is defined as long-term debt issuance minus long-term debt reduction plus changes in current debt and normalized by firms' total assets. Δeqt is defined as sale of common and preferred stock minus purchases of common and preferred stock and normalized by firm's total assets. Δnet is the defined as Δdet minus Δeqt. Other control variable definitions are *Leverage*: ratio of the sum of short-term debt (*Sd*) and long-term debt (*Ld*) to the sum of short-term debt, long-term debt, and stockholders' equity. *Size:* logarithm of sales. *Price***:** logarithm of the close price of the quarter. *Liquidity*: ratio of cash and cash equivalent divided (normalized) by total assets. *Profit***:** ratio of *EBITDA* to total assets. *Dividends*: ratio of dividends to total assets. *Earnings***:** ratio of retained earnings to total assets. *Growth***:** total debt book value plus quarterly close price multiply outstanding common stock shares and normalized by total assets. *Tangibility*: ratio of property plant and equipment (Net) to total assets. *NDTS*: ratio of deferred taxes and investment tax credit to total assets. Panel B lists firm characteristics by financing types. The four types are defined as: *Debt only* financing firms are those with positiveΔdet but non-positive Δeqt; *Equity only* financing firms are those with positive Δeqt but non-positive Δdet; *Dual* financing means both Δdet and Δeqt are positive and *Internal* financing is assumed if no issuance is made, which means both Δdet and Δeqt are both non-positive. Outliers do not contaminate the results as shown in Appendix 1 and 2.

Panel A Summary statistics of dependant and control variables

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	125,805	0.006	0.000	0.086	-1.414	11.164
Δeqt	229,674	0.014	0.000	0.161	-1.795	17.584
Δnet	114,970	-0.010	-0.002	0.200	-17.584	11.164
$\Delta Sdet$	134,263	0.002	0.000	0.049	-1.414	3.885
$\Delta Ldet$	230,587	0.005	0.000	0.088	-3.876	11.164
Leverage	114,970	0.226	0.160	0.240	0.000	1.000
Size	114,970	3.280	3.266	2.520	-6.908	11.730
Price	114,970	1.953	2.183	1.529	-7.419	11.523
Liquidity	114,970	0.197	0.102	0.225	-0.034	1.000
Profit	114,970	0.007	0.024	0.224	-59.926	13.207
Dividends	114,970	0.007	0.000	0.037	-0.012	3.700
Earnings	114,970	-0.653	0.141	9.344	-2624.430	2.337
Growth	114,970	1.957	1.167	8.760	0.001	2370.330
Tangibility	114,970	0.258	0.191	0.227	0.000	1.000
NDTS	114,970	0.018	0.000	0.033	-0.013	0.692
Pricechange	255,519	-0.014	-0.010	0.364	-7.107	9.420

Panel B Firm characteristics by financing types

Financing types	% of Obs.	*Leverage*	*Size*	*Price*	*Liquidity*	*Profit*	*Dividends*	*Earnings*	*Growth*	*Tangibility*	*NDTS*
Dual	5.19%	0.313	4.115	2.322	0.090	-0.001	0.002	-0.422	1.967	0.312	0.022
Debt only	8.93%	0.356	4.164	2.023	0.076	0.006	0.003	-0.457	1.480	0.315	0.022
Equity only	30.66%	0.245	3.684	2.192	0.203	-0.002	0.002	-1.222	2.427	0.276	0.017
Internal	55.22%	0.289	3.542	1.762	0.184	-0.002	0.003	-1.576	1.956	0.285	0.019

Table 3.1 *(Continued)*

Panel C Separate summary statistics for 'good' issuers and 'bad' issuers

'Good' issuers

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	781	0.008	0.000	0.110	-0.514	1.825
Δeqt	781	0.002	0.000	0.040	-0.153	0.851
Δnet	781	0.006	-0.001	0.116	-0.496	1.824
$\Delta Sdet$	781	0.001	0.000	0.043	-0.509	0.446
$\Delta Ldet$	781	0.007	0.000	0.102	-0.448	1.910
Leverage	781	0.441	0.426	0.220	0.000	0.996
Size	781	6.042	6.149	1.651	-2.096	10.250
Price	781	3.057	3.252	0.996	-2.364	5.045
Liquidity	781	0.096	0.052	0.119	0.000	0.772
Profit	781	0.030	0.029	0.042	-0.540	0.305
Dividends	781	0.002	0.000	0.005	-0.006	0.057
Earnings	781	0.110	0.147	0.454	-8.965	1.774
Growth	781	1.370	1.085	1.048	0.024	11.869
Tangibility	781	0.346	0.296	0.232	0.002	0.951
NDTS	781	0.031	0.016	0.039	0.000	0.199

'Bad' issuers

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	1,288	0.020	0.000	0.137	-0.333	2.604
Δeqt	1,288	0.002	0.000	0.047	-0.318	1.250
Δnet	1,288	0.018	0.001	0.146	-1.263	2.578
$\Delta Sdet$	1,288	0.003	0.000	0.071	-0.416	1.998
$\Delta Ldet$	1,288	0.017	0.000	0.123	-0.333	2.604
Leverage	1,288	0.439	0.436	0.221	0.000	0.984
Size	1,288	6.006	6.090	1.732	-3.689	11.170
Price	1,288	2.890	3.044	0.998	-2.040	11.523
Liquidity	1,288	0.073	0.032	0.112	0.000	0.927
Profit	1,288	0.017	0.022	0.053	-0.667	0.190
Dividends	1,288	0.003	0.001	0.006	-0.060	0.070
Earnings	1,288	0.176	0.193	0.354	-4.389	1.262
Growth	1,288	1.213	0.927	1.048	0.261	13.720
Tangibility	1,288	0.364	0.314	0.225	0.000	0.984
NDTS	1,288	0.033	0.020	0.038	0.000	0.290

Table 3.1 *(Continued)*

Panel D Correlation Matrix of Control Variables

Correlations
Prob > |r| under H0: Rho=0
Number of Observations

	Leverage	*Size*	*Price*	*Liquidity*	*Profit*	*Dividends*	*Earnings*	*Growth*	*Tangibility*	*NDTS*
Leverage	1									
	482741									
Size	0.29849	1								
	<.0001									
	464442	***464442***								
Price	0.14737	0.64371	1							
	<.0001	<.0001								
	457695	***439666***	***457695***							
Liquidity	-0.47375	-0.35971	-0.19247	1						
	<.0001	<.0001	<.0001							
	481406	***463178***	***456513***	***481406***						
Profit	0.00508	0.01173	0.01776	-0.01382	1					
	0.0009	<.0001	<.0001	<.0001						
	426976	***411602***	***403291***	***426188***	***426976***					
Dividends	-0.02863	0.00217	0.01027	0.04786	0.00264	1				
	<.0001	0.1667	<.0001	<.0001	0.1035					
	425018	***407715***	***406482***	***424267***	***381663***	***425018***				
Earnings	0.01671	0.03971	0.04321	-0.0264	0.0387	-0.01433	1			
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001				
	463760	***446122***	***440140***	***462709***	***411227***	***410232***	***463760***			
Growth	-0.02547	-0.05764	-0.01154	0.03243	-0.09767	0.01081	-0.29597	1		
	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001			
	450557	***432878***	***450557***	***449552***	***398284***	***402005***	***435506***	***450557***		
Tangibility	0.15320	0.20122	0.02730	-0.32696	0.00402	-0.00511	0.01015	-0.00871	1	
	<.0001	<.0001	<.0001	<.0001	0.0089	0.0009	<.0001	<.0001		
	476849	***458706***	***452504***	***475846***	***424394***	***419683***	***458215***	***445624***	***476849***	
NDTS	0.20821	0.31825	0.29182	-0.27923	0.00523	0.00858	0.01114	-0.0131	0.49628	1
	<.0001	<.0001	<.0001	<.0001	0.0015	<.0001	<.0001	<.0001	<.0001	
	408032	***390149***	***384190***	***407293***	***367056***	***383357***	***392643***	***378432***	***403098***	***408032***

Table 3. 2 Estimation of delayed rating changes' impacts on financing throughout periods around rating changes

Values of estimated coefficients and their *t-statistic* of Equations (3.5a)-(3.5c) for non-financial firms. Estimated parameters on rating indicators indicate influences of delayed rating changes on financing plan making. The numbers in brackets underneath coefficient estimates are *t-statistic*. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively. The four panels show the financing adjustments during the four periods from two periods before and two periods after rating changes.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes (τ = 3)**		
	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t-1}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$	$\Delta net_{i,t+3}$
Intercept	0.01024***	0.02237***	-0.01663***	0.01165***	0.01910***	-0.01091***	0.0122***	0.01734***	-0.00749***	0.012***	0.01737***	-0.00777***
	(8.39)	(13.12)	(-5.07)	(15.69)	(18.58)	(-6.29)	(16.44)	(18.43)	(-4.62)	(16.19)	(18.47)	(-4.80)
OR^U	-0.00080	0.00626	-0.00805	0.00527*	0.00901***	-0.00231	0.00755***	0.00392	0.00189	0.00476*	0.01331***	-0.02182***
	(-0.17)	(1.10)	(-0.62)	(1.78)	(2.57)	(-0.33)	(2.49)	(1.21)	(0.28)	(2.05)	(5.13)	(-4.31)
OR^D	0.00760*	0.00987**	-0.00897	0.01809***	0.00550*	0.01065*	0.01775***	0.00654***	0.00904*	0.00856***	0.00597***	-0.00165
	(1.95)	(2.06)	(-0.86)	(7.76)	(1.93)	(1.96)	(7.69)	(2.51)	(1.80)	(3.80)	(2.35)	(-0.34)
Leverage	-0.01440***	0.02491***	-0.04356***	-0.01636***	0.01442***	-0.02733***	-0.01564***	0.01429***	-0.03061***	-0.01531***	0.01406***	-0.02970***
	(-7.27)	(9.65)	(-8.16)	(-13.60)	(9.30)	(-9.71)	(-13.08)	(10.12)	(-11.70)	(-12.79)	(9.95)	(-11.34)
Size	-0.00139***	-0.01101***	0.01077***	-0.00171***	-0.00972***	0.00873***	-0.00178***	-0.00932***	0.00835***	-0.00172***	-0.00933***	0.00843***
	(-5.61)	(-31.36)	(15.99)	(-11.30)	(-45.92)	(24.48)	(-11.80)	(-48.12)	(25.03)	(-11.44)	(-48.24)	(25.32)
Price	0.00255***	0.00821***	-0.00678***	0.00258***	0.00839***	-0.00698***	0.00241***	0.00729***	-0.00535***	0.00239***	0.00727***	-0.00533***
	(6.60)	(15.34)	(-6.51)	(11.01)	(26.19)	(-12.77)	(10.38)	(25.06)	(-10.57)	(10.31)	(24.99)	(-10.54)
Liquidity	-0.02042***	0.01778***	-0.02986***	-0.01859***	0.00847***	-0.01878***	-0.01853***	0.0087***	-0.02315***	-0.01838***	0.00859***	-0.02275***
	(-9.14)	(5.39)	(-4.87)	(-13.64)	(4.25)	(-5.78)	(-13.57)	(4.75)	(-7.60)	(-13.45)	(4.69)	(-7.47)
Profit	-0.00039	-0.17600***	0.21027***	-0.00311***	-0.16245***	0.19357***	-0.00201***	-0.07141***	0.06504***	-0.00204***	-0.07141***	0.06501***
	(-0.20)	(-55.05)	(42.10)	(-2.66)	(-83.84)	(72.68)	(-2.73)	(-60.40)	(41.92)	(-2.77)	(-60.40)	(41.91)
Dividends	0.00034	-0.00217	0.00402	0.00005	-0.0023	0.00322	-0.00101	-0.02612*	0.04251*	-0.00120	-0.02603*	0.04198*
	(0.04)	(-0.15)	(0.18)	(0.01)	(-0.25)	(0.27)	(-0.11)	(-1.81)	(1.96)	(-0.13)	(-1.80)	(1.93)
Earnings	0.00007	-0.00151***	0.00115***	-0.00013***	-0.00125***	0.00087***	-0.00016***	-0.00151***	0.00109***	-0.00016***	-0.00151***	0.00109***
	(-1.54)	(-18.91)	(9.86)	(-4.72)	(-25.88)	(14.06)	(-5.55)	(-32.06)	(17.51)	(-5.58)	(-32.06)	(17.49)
Growth	0.00006	0.00291***	-0.00183***	0.00007***	0.00286***	-0.00179***	0.00013***	0.00337***	-0.00256***	0.00013***	0.00337***	-0.00255***
	(1.25)	(33.4)	(-14.26)	(2.41)	(54.31)	(-26.33)	(4.20)	(68.65)	(-39.52)	(4.20)	(68.65)	(-39.51)
Tangibility	0.00580***	0.00740***	-0.00447	0.00733***	0.00984***	-0.00709***	0.00634***	0.00991***	-0.00886***	0.00643***	0.00988***	-0.00867***
	(2.72)	(2.78)	(-0.78)	(5.66)	(6.14)	(-2.36)	(4.91)	(6.78)	(-3.16)	(4.98)	(6.76)	(-3.09)
NDTS	-0.01062	-0.02585	0.05079	-0.02605***	-0.03018***	0.02894	-0.02320***	-0.04002***	0.04595***	-0.02276***	-0.04000***	0.04664***
	(-0.76)	(-1.46)	(1.36)	(-3.05)	(-2.82)	(1.46)	(-2.71)	(-4.08)	(2.48)	(-2.66)	(-4.08)	(2.51)
Adj R-square	0.0014	0.0393	0.0314	0.0045	0.0816	0.0800	0.0044	0.0718	0.0531	0.0041	0.0719	0.0532
N	121,123	221,313	110,657	125,805	229,674	114,970	126,693	231,399	115,779	126,693	231,399	115,779

Table 3. 3 DCRC's effects of firms on short-term and long-term debt

Values of estimated coefficients and their *t-statistic* of Equations (3.7a) and (3.7b) for nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on financing plan making one period before rating changes. Rating changes take places at quarter *t+1*. $\Delta Sdet_{i,t}$ is the net issuance of short-term debt normalized by total asset while $\Delta Ldet_{i,t}$ is the net issuance of long-term debt normalized by total asset. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Panel A One quarter before rating changes (τ = -1)		**Panel B** One quarter before rating changes (τ = 0)		**Panel C** One quarter after rating changes (τ = 2)		**Panel D** Two quarters after rating changes (τ = 3)	
	Short-term debt	**Long-term debt**	**Short-term debt**	**Long-term debt**	**Short-term debt**	**Long-term debt**	**Short-term debt**	**Long-term debt**
	$\Delta Sdet_{i,t-1}$	$\Delta Ldet_{i,t-1}$	$\Delta Sdet_{i,t}$	$\Delta Ldet_{i,t}$	$\Delta Sdet_{i,t+2}$	$\Delta Ldet_{i,t+2}$	$\Delta Sdet_{i,t+3}$	$\Delta Ldet_{i,t+3}$
Intercept	0.00643***	0.00657***	0.00728***	0.00719***	0.00759***	0.00723***	0.00757***	0.00697
	(6.22)	(11.37)	(17.51)	(12.35)	(18.41)	(12.15)	(18.37)	(11.72)
OR^U	0.00073	0.00202	0.00213	0.00003	0.00301*	0.00435**	0.00184	0.00147
	(0.18)	(1.04)	(1.31)	(0.01)	(1.82)	(2.11)	(1.44)	(0.89)
OR^D	0.00160	0.00884***	0.00377***	0.01725***	0.00025	0.02109***	0.00039	0.00873***
	(0.50)	(5.29)	(3.00)	(10.30)	(0.20)	(12.42)	(0.32)	(5.29)
Leverage	-0.00946***	-0.00966***	-0.01174***	-0.00903***	-0.01147***	-0.00841***	-0.01147***	-0.00795***
	(-5.67)	(-11.01)	(-17.54)	(-10.25)	(-17.38)	(-9.39)	(-17.35)	(-8.87)
Size	-0.00033	-0.00193***	-0.00053***	-0.00204***	-0.00057***	-0.0021***	-0.00056***	-0.00202***
	(-1.55)	(-16.36)	(-6.21)	(-17.18)	(-6.77)	(-17.31)	(-6.73)	(-16.69)
Price	0.00040	0.00367***	0.000484***	0.00363***	0.00042***	0.00350***	0.00042***	0.00347***
	(1.22)	(20.21)	(3.69)	(19.99)	(3.27)	(19.02)	(3.27)	(18.88)
Liquidity	-0.01346***	-0.01308***	-0.01151***	-0.01348***	-0.01186***	-0.01315***	-0.01185***	-0.01293***
	(-7.06)	(-12.12)	(-14.99)	(-12.38)	(-15.52)	(-11.79)	(-15.50)	(-11.58)
Profit	0.00083	-0.00403***	-0.002***	-0.00429***	-0.00100***	-0.00227***	-0.00100***	-0.00233***
	(0.50)	(-3.76)	(-2.98)	(-3.95)	(-2.39)	(-3.04)	(-2.39)	(-3.12)
Dividends	0.00011	0.00411	-0.00016	0.00390	0.00223	0.01011	0.00225	0.01002
	(0.02)	(0.97)	(-0.05)	(0.89)	(0.42)	(1.28)	(0.42)	(1.27)
Earnings	-0.00004	-0.00017***	-0.00004***	-0.00023***	-0.00004***	-0.00029***	-0.00004***	-0.00029***
	(-0.95)	(-6.16)	(-2.63)	(-8.31)	(-2.39)	(-9.78)	(-2.40)	(-9.81)
Growth	-0.00002	0.00021***	-0.00000	0.00020***	0.00002	0.00026***	0.00002	0.00026***
	(-0.48)	(7.22)	(-0.24)	(6.78)	(1.20)	(8.42)	(1.20)	(8.44)
Tangibility	-0.00127	0.01014***	0.00033	0.00955***	0.00036	0.00941***	0.00036	0.00953***
	(-0.71)	(11.11)	(0.46)	(10.39)	(0.5)	(10.05)	(0.51)	(10.18)
NDTS	0.00614	-0.02862***	-0.00581	-0.02852***	-0.00631	-0.02963***	-0.00630	-0.02893***
	(0.53)	(-4.68)	(-1.23)	(-4.62)	(-1.35)	(-4.69)	(-1.34)	(-4.58)
Adj R-square	0.0004	0.0043	0.0034	0.0044	0.0035	0.0045	0.0035	0.0039
N	129,305	222,222	134,263	230,587	135,211	232,185	135,211	232,185

Table 3. 4 Firm financing around changes in individual Ratings

Values of estimated coefficients and their *t-statistic* of Equitation (3.6a)-(3.6c) for non-financial firms. Estimated parameters on rating indicators indicate influences of delayed rating changes on financing plan making. The numbers in brackets underneath coefficient estimates are *t-statistic.* *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively. The four panels show the financing adjustments during the four periods from two periods before and two periods after rating changes. S&P Long Term Credit Rating, S&P Short Term Credit Rating, S&P Subordinated Debt Rating and S&P Quality Ranking are the four individual rating indicators.

	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**		
	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t-1}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t}$
Intercept	0.01025***	0.02253***	-0.01689***	0.01185***	0.01927***	-0.01091***
	(8.40)	(13.20)	(-5.14)	(15.94)	(18.72)	(-6.28)
LTD^U	-0.00385	0.00589	-0.01027	-0.00018	0.00895***	-0.0073
	(-0.71)	(0.93)	(-0.70)	(-0.05)	(2.30)	(-0.93)
LTD^D	0.00892**	0.00888*	-0.00582	0.02205***	0.00470	0.01474***
	(2.06)	(1.70)	(-0.50)	(8.36)	(1.49)	(2.40)
STD^U	-0.00485	0.00980	-0.01511	0.00273	0.00851	-0.00724
	(-0.42)	(0.61)	(-0.49)	(0.39)	(0.90)	(-0.45)
STD^D	-0.00399	0.00624	-0.00867	-0.01378***	0.00848	-0.02083*
	(-0.47)	(0.54)	(-0.38)	(-2.74)	(1.23)	(-1.78)
SUB^U	0.01644	-0.00352	0.01558	0.02837***	0.00033	0.0304*
	(1.51)	(-0.28)	(0.53)	(3.93)	(0.04)	(1.80)
SUB^D	0.00260	-0.00135	-0.00866	0.02139***	-0.00580	0.03545**
	(0.18)	(-0.08)	(-0.23)	(2.93)	(-0.65)	(2.10)
$Equity^U$	-0.00205	-0.00234	-0.00005	-0.00482***	-0.00374	-0.00082
	(-0.64)	(-0.56)	(-0.01)	(-2.38)	(-1.45)	(-0.17)
$Equity^D$	0.00027	-0.00593*	0.01164	-0.00599***	-0.00545***	0.00104
	(0.11)	(-1.84)	(1.79)	(-3.93)	(-2.76)	(0.29)
Leverage	-0.01448***	0.02501***	-0.04377***	-0.01651***	0.01454***	-0.02768***
	(-7.31)	(9.69)	(-8.20)	(-13.72)	(9.37)	(-9.83)
Size	-0.00138***	-0.01101***	0.01077***	-0.00168***	-0.00972***	0.00876***
	(-5.57)	(-31.35)	(15.99)	(-11.12)	(-45.91)	(24.56)
Price	0.00255***	0.00823***	-0.00681***	0.00258***	0.00841***	-0.00701***
	(6.59)	(15.37)	(-6.54)	(11.02)	(26.23)	(-12.81)
Liquidity	-0.02044***	0.01770***	-0.02976***	-0.01871***	0.00839***	-0.01881***
	(-9.15)	(5.36)	(-4.85)	(-13.73)	(4.21)	(-5.79)
Profit	-0.00037	-0.17604***	0.21037***	-0.00315***	-0.16249***	0.19357***
	(-0.20)	(-55.05)	(42.12)	(-2.69)	(-83.84)	(72.67)
Dividends	0.00036	-0.00220	0.00410	0.00014	-0.00231	0.00328
	(0.04)	(-0.15)	(0.18)	(0.03)	(-0.25)	(0.27)
Earnings	-0.00007	-0.00151***	0.00115***	-0.00013***	-0.00125***	0.00087***
	(-1.54)	(-18.91)	(9.85)	(-4.72)	(-25.87)	(14.06)
Growth	0.00006	0.00291***	-0.00183***	0.00007***	0.00286***	-0.00179***
	(1.25)	(33.38)	(-14.24)	(2.39)	(54.28)	(-26.32)
Tangibility	0.00575***	0.00740***	-0.00447	0.00719***	0.00982***	-0.00718***
	(2.70)	(2.78)	(-0.79)	(5.55)	(6.13)	(-2.39)
NDTS	-0.01036	-0.02581	0.05076	-0.02565***	-0.03020***	0.02934
	(-0.74)	(-1.46)	(1.36)	(-3.01)	(-2.82)	(1.48)
Adj R-square	0.0013	0.0393	0.0314	0.0050	0.0816	0.0801
N	121,123	221,313	110,657	125,805	229,674	114,970

Table 3.4 *(Continued)*

	Panel C One quarter before rating changes ($\tau = 2$)			**Panel D Two quarters after rating changes ($\tau = 3$)**		
	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$	$\Delta net_{i,t+3}$
Intercept	0.01226***	0.01748***	-0.00757***	0.01204***	0.01752***	-0.00791***
	(16.50)	(18.55)	(-4.66)	(16.18)	(18.58)	(-4.87)
LTD^U	0.00472	0.00311	0.00040	0.00162	0.01568***	-0.03107***
	(1.41)	(0.87)	(0.05)	(0.63)	(5.49)	(-5.53)
LTD^D	0.02050***	0.00617**	0.01257**	0.01062***	0.00551*	0.00065
	(7.73)	(2.11)	(2.17)	(4.16)	(1.96)	(0.12)
STD^U	0.00962	0.00719	0.00226	0.00063	-0.00496	0.01691
	(1.30)	(0.79)	(0.14)	(0.11)	(-0.72)	(1.36)
STD^D	-0.00253	0.00758	-0.01223	-0.00943*	0.00778	-0.01800*
	(-0.52)	(1.26)	(-1.15)	(-1.94)	(1.27)	(-1.71)
SUB^U	0.00829	0.00211	0.00961	0.01033*	-0.00595	0.02334*
	(1.07)	(0.27)	(0.56)	(1.68)	(-0.90)	(1.73)
SUB^D	-0.00653	-0.00761	0.00361	0.00585	-0.00694	0.02026
	(-0.97)	(-0.99)	(0.25)	(0.89)	(-0.94)	(1.43)
$Equity^U$	0.00104	-0.00516**	0.00525	0.00082	-0.00344*	0.00483
	(0.51)	(-2.17)	(1.19)	(0.51)	(-1.80)	(1.38)
$Equity^D$	-0.00331**	-0.00336*	0.00052	-0.00219	-0.00363**	0.00447
	(-2.22)	(-1.86)	(0.16)	(-1.55)	(-2.14)	(1.45)
Leverage	-0.01565***	0.01437***	-0.03074***	-0.01535***	0.01422***	-0.03014***
	(-13.08)	(10.17)	(-11.74)	(-12.82)	(10.06)	(-11.51)
Size	-0.00178***	-0.00933***	0.00835***	-0.00171***	-0.00934***	0.00846***
	(-11.78)	(-48.12)	(25.05)	(-11.33)	(-48.25)	(25.37)
Price	0.00241***	0.00732***	-0.00536***	0.00239***	0.00730***	-0.00539***
	(10.41)	(25.13)	(-10.59)	(10.28)	(25.08)	(-10.64)
Liquidity	-0.01856***	0.00863***	-0.02313***	-0.01839***	0.00852***	-0.02271***
	(-13.59)	(4.71)	(-7.59)	(-13.46)	(4.65)	(-7.46)
Profit	-0.00202***	-0.07140***	0.06503***	-0.00205***	-0.07140***	0.06501***
	(-2.74)	(-60.39)	(41.92)	(-2.78)	(-60.40)	(41.91)
Dividends	-0.00096	-0.02623*	0.04263*	-0.00124	-0.02624*	0.04210*
	(-0.10)	(-1.82)	(1.96)	(-0.13)	(-1.82)	(1.94)
Earnings	-0.00016***	-0.00151***	0.00109***	-0.00016***	-0.00151***	0.00109***
	(-5.55)	(-32.05)	(17.50)	(-5.58)	(-32.04)	(17.48)
Growth	0.00013***	0.00337***	-0.00255***	0.00013***	0.00337***	-0.00255***
	(4.18)	(68.63)	(-39.51)	(4.20)	(68.62)	(-39.49)
Tangibility	0.00634***	0.00989***	-0.00885***	0.00643***	0.00988***	-0.00872***
	(4.91)	(6.77)	(-3.16)	(4.98)	(6.76)	(-3.11)
NDTS	-0.02310***	-0.04009***	0.04613***	-0.02248***	-0.04011***	0.04705***
	(-2.70)	(-4.08)	(2.48)	(-2.63)	(-4.09)	(2.54)
Adj R-square	0.0045	0.0718	0.0530	0.0041	0.0719	0.0533
N	126,693	231,399	115,779	126,693	231,399	115,779

Table 3. 5 Firm financing before and after changes in individual Ratings

Values of estimated coefficients and their *t-statistic* for non-financial firms. Estimated parameters on rating indicators indicate influences of delayed rating changes on financing plan making. The numbers in brackets underneath coefficient estimates are *t-statistic.* *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes. S&P Long Term Credit Rating, S&P Short Term Credit Rating, S&P Subordinated Debt Rating and S&P Quality Ranking are the four individual rating indicators.

	Panel A Two quarters before rating changes (τ = -1)		**Panel B One quarter before rating changes (τ = 0)**		**Panel C One quarter after rating changes (τ = 2)**		**Panel D Two quarters after rating changes (τ = 3)**	
	Short-term debt	**Long-term debt**	**Short-term debt**	**Long-term debt**	**Short-term debt**	**Long-term debt**	**Short-term debt**	**Long-term debt**
	$\Delta Sdet_{i,t-1}$	$\Delta Ldet_{i,t-1}$	$\Delta Sdet_{i,t}$	$\Delta Ldet_{i,t}$	$\Delta Sdet_{i,t+2}$	$\Delta Ldet_{i,t+2}$	$\Delta Sdet_{i,t+3}$	$\Delta Ldet_{i,t+3}$
Intercept	0.00641***	0.00663***	0.00735***	0.00730***	0.00757***	0.00731***	0.00756***	0.00704***
	(6.19)	(11.45)	(17.66)	(12.52)	(18.34)	(12.27)	(18.29)	(11.80)
LTD^U	0.00094	-0.00052	0.00113	-0.00328	0.00471***	0.00082	0.00008	0.00011
	(0.21)	(-0.24)	(0.62)	(-1.48)	(2.57)	(0.36)	(0.06)	(0.06)
LTD^D	0.00160	0.00844***	0.00459***	0.02001***	0.00006	0.02366***	-0.00062	0.00851***
	(0.45)	(4.66)	(3.22)	(10.90)	(0.04)	(12.51)	(-0.45)	(4.70)
STD^U	-0.00460	-0.00350	0.00017	-0.00143	-0.00663*	0.00973	-0.00006	-0.00105
	(-0.48)	(-0.62)	(0.05)	(-0.25)	(-1.65)	(1.59)	(-0.02)	(-0.23)
STD^D	0.00074	-0.00330	-0.00104	-0.01379***	0.00230	-0.00684*	-0.00159	-0.00520
	(0.11)	(-0.80)	(-0.39)	(-3.32)	(0.89)	(-1.69)	(-0.61)	(-1.27)
SUB^U	0.00562	0.00961**	0.00027	0.01822***	-0.00106	0.01181***	0.00912***	0.00671
	(0.63)	(2.22)	(0.07)	(3.90)	(-0.25)	(2.44)	(2.73)	(1.57)
SUB^D	-0.00414	0.01308**	0.00068	0.01002*	-0.00382	0.00136	0.00579*	0.01169***
	(-0.37)	(2.20)	(0.18)	(1.88)	(-1.06)	(0.27)	(1.65)	(2.40)
$Equity^U$	0.00011	-0.00382***	-0.00151	-0.00361***	0.00145	0.00291*	-0.00006	0.00116
	(0.04)	(-2.65)	(-1.34)	(-2.44)	(1.30)	(1.90)	(-0.07)	(0.94)
$Equity^D$	0.00097	-0.00151	-0.00285***	-0.00331***	-0.00042	-0.00527***	0.00014	-0.00359***
	(0.48)	(-1.36)	(-3.38)	(-2.93)	(-0.52)	(-4.54)	(0.18)	(-3.29)
Leverage	-0.00948***	-0.00969***	-0.01170***	-0.00917***	-0.01143***	-0.00845***	-0.01148***	-0.00799***
	(-5.69)	(-11.04)	(-17.48)	(-10.40)	(-17.31)	(-9.44)	(-17.36)	(-8.91)
Size	-0.00032	-0.00191***	-0.00052***	-0.00202***	-0.00057***	-0.00209***	-0.00056***	-0.00201***
	(-1.55)	(-16.21)	(-6.14)	(-17.00)	(-6.77)	(-17.23)	(-6.63)	(-16.55)
Price	0.00040	0.00367***	0.00049***	0.00363***	0.00042***	0.00349***	0.00042***	0.00346***
	(1.21)	(20.24)	(3.74)	(19.99)	(3.24)	(18.98)	(3.22)	(18.80)
Liquidity	-0.01345***	-0.01311***	-0.01154***	-0.01354***	-0.01184***	-0.01317***	-0.01183***	-0.01295***
	(-7.05)	(-12.15)	(-15.02)	(-12.44)	(-15.49)	(-11.80)	(-15.48)	(-11.60)
Profit	0.00083	-0.00402***	-0.00202***	-0.00431***	-0.00101***	-0.00230***	-0.00101***	-0.00234***
	(0.50)	(-3.75)	(-3.01)	(-3.97)	(-2.40)	(-3.08)	(-2.39)	(-3.13)
Dividends	0.00012	0.00412	-0.00013	0.00396	0.00222	0.01024	0.00226	0.01010
	(0.02)	(0.97)	(-0.04)	(0.91)	(0.42)	(1.29)	(0.43)	(1.28)
Earnings	-0.00004	-0.00017***	-0.00004***	-0.00023***	-0.00004***	-0.00029***	-0.00004***	-0.00029***
	(-0.95)	(-6.17)	(-2.62)	(-8.32)	(-2.39)	(-9.77)	(-2.41)	(-9.81)
Growth	-0.00002	0.00021***	0.00000	0.00020***	0.00002	0.00026***	0.00002	0.00026***
	(-0.48)	(7.22)	(-0.27)	(6.76)	(1.19)	(8.40)	(1.21)	(8.43)
Tangibility	-0.00128	0.01012***	0.00031	0.00950***	0.00037	0.00942***	0.00036	0.00953***
	(-0.72)	(11.08)	(0.43)	(10.33)	(0.52)	(10.06)	(0.51)	(10.18)
NDTS	0.00622	-0.02827***	-0.00574	-0.02787***	-0.00632	-0.02928***	-0.00621	-0.02858***
	(0.53)	(-4.62)	(-1.22)	(-4.51)	(-1.35)	(-4.64)	(-1.33)	(-4.52)
Adj R-square	0.0004	0.0044	0.0034	0.0047	0.0035	0.0047	0.0035	0.0040
N	129,305	222,222	134,263	230,587	135,211	232,185	135,211	232,185

Table 3. 6 DCRC's effects of firms in different rating groups and Application of short-term debt and long-term debt

Values of estimated coefficients and their *t-statistic* for the sample of nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on financing plan making one period before rating changes. Rating changes take places at quarter *t+1*. $\Delta Sdet_{i,t}$ is the net issuance of short-term debt normalized by total asset while $\Delta Ldet_{i,t}$ is the net issuance of long-term debt normalized by total asset. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Panel A One quarter before rating changes ($\tau = 0$)						**Panel B** One quarter after rating changes ($\tau = 2$)					
	Investment-grade (BBB above inclusive)			**Speculative-grade (BBB below)**			**Investment-grade (BBB above inclusive)**			**Speculative-grade (BBB below)**		
	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+2}$
Intercept	0.01178***	0.01942***	-0.01113***	0.07828***	0.00517***	0.06452***	0.01203***	0.01773***	-0.00798***	0.06679***	0.00759***	0.05173***
	(15.99)	(17.12)	(-6.07)	(9.70)	(2.68)	(7.37)	(15.99)	(17.09)	(-4.65)	(9.48)	(4.33)	(6.78)
OR^U	0.00491	0.00896*	-0.00401	-0.00315	0.00512***	-0.00407	0.00145	0.00335	-0.00318	0.00970*	0.00126	0.00646
	(1.33)	(1.80)	(-0.44)	(-0.48)	(3.27)	(-0.57)	(0.37)	(0.72)	(-0.36)	(1.69)	(0.90)	(1.03)
OR^D	0.00860***	0.00944*	-0.00162	0.01527***	0.00148	0.01133***	0.01226***	0.01077***	-0.0019	0.01903***	0.00093	0.01988***
	(2.68)	(1.94)	(-0.20)	(3.27)	(1.33)	(2.24)	(3.87)	(2.53)	(-0.26)	(4.68)	(0.92)	(4.53)
Leverage	-0.0185***	0.01534***	-0.03008***	-0.05843***	0.00216	-0.05757***	-0.01679***	0.0149***	-0.03217***	-0.0498***	0.00067	-0.04804***
	(-14.74)	(8.49)	(-9.62)	(-8.94)	(1.39)	(-8.13)	(-13.18)	(9.08)	(-11.06)	(-8.71)	(0.47)	(-7.75)
Size	-0.00143***	-0.01035***	0.00958***	-0.00985	-0.00239***	-0.00716***	-0.00158***	-0.00998***	0.00911***	-0.00825***	-0.00246***	-0.00554***
	(-9.53)	(-44.14)	(25.33)	(-10.1)	(-9.56)	(-6.77)	(-10.29)	(-46.50)	(25.70)	(-9.71)	(-10.86)	(-6.03)
Price	0.0019***	0.00904***	-0.0083***	0.00384***	0.00135***	0.0023	0.00195***	0.00795***	-0.00640***	0.00456***	0.00179***	0.00332**
	(8.21)	(25.77)	(-14.44)	(2.26)	(3.25)	(1.23)	(8.32)	(24.95)	(-11.99)	(3.15)	(4.84)	(2.08)
Liquidity	-0.01783***	0.00841***	-0.01765***	-0.08262***	-0.0111***	-0.07417***	-0.01753***	0.00859***	-0.02189***	-0.07182***	-0.00822***	-0.06051***
	(-13.28)	(3.88)	(-5.18)	(-7.48)	(-3.93)	(-6.12)	(-12.73)	(4.31)	(-6.84)	(-7.43)	(-3.22)	(-5.73)
Profit	-0.00349***	-0.16364***	0.19372***	0.05332**	-0.01442***	0.06292***	-0.00208***	-0.07143***	0.06493***	0.03213	-0.01774***	0.05557***
	(-3.10)	(-79.88)	(71.06)	(2.13)	(-2.62)	(2.34)	(-2.87)	(-57.37)	(40.84)	(1.32)	(-3.36)	(2.10)
Dividends	0.000658	-0.00206	0.00345	0.0277	0.00259	0.03674	-0.00045	-0.02673*	0.04284*	0.06156	0.00332	0.07756
	(0.13)	(-0.21)	(0.28)	(0.27)	(0.12)	(0.34)	(-0.05)	(-1.72)	(1.91)	(0.73)	(0.18)	(0.81)
Earnings	-0.00013***	-0.00125***	0.000873***	0.00222	-0.00496***	0.00572	-0.00016***	-0.00150***	0.00109***	0.00040	-0.00441***	0.00350
	(-4.85)	(-24.49)	(13.76)	(0.66)	(-5.48)	(1.59)	(-5.56)	(-30.35)	(17.08)	(0.14)	(-5.58)	(1.16)
Growth	0.00006***	0.00284***	-0.00179***	0.01269***	0.00547***	0.01408***	0.00013***	0.00336***	-0.00255***	0.00625***	0.00319***	0.00655***
	(2.23)	(51.23)	(-25.72)	(10.19)	(13.50)	(9.02)	(4.25)	(65.07)	(-38.50)	(5.22)	(7.99)	(4.28)
Tangibility	0.0061***	0.01008***	-0.00829***	0.00537	0.0058***	-0.00553	0.00580***	0.01036***	-0.00964***	0.00168	0.00458***	-0.00805
	(4.66)	(5.55)	(-2.56)	(0.91)	(4.44)	(-0.86)	(4.34)	(6.26)	(-3.19)	(0.33)	(3.92)	(-1.47)
NDTS	-0.01888**	-0.03103***	0.03763*	-0.10921***	-0.02662***	-0.05821	-0.02004***	-0.04296***	0.05206***	-0.07234**	-0.01913***	-0.02438
	(-2.19)	(-2.56)	(1.77)	(-2.86)	(-3.05)	(-1.40)	(-2.26)	(-3.88)	(2.60)	(-2.20)	(-2.43)	(-0.68)
Adj R-square	0.0041	0.0824	0.0826	0.0413	0.0206	0.0314	0.0040	0.0724	0.0545	0.0284	0.0143	0.0210
N	116,727	205,922	106,677	9,078	23,752	8,293	117,683	207,660	107,542	9,010	23,739	8,237

Table 3. 7 Price responses to the debt-equity financing

Values of estimated coefficients and their *t-statistic* for nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on price changes in the period of rating changes and in the periods after rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take places at quarter *t+1*. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Panel A One quarter before rating changes ($\tau = 1$)	**Panel B In the quarter of rating changes ($\tau = 2$)**	**Panel C One quarter after rating changes ($\tau = 3$)**
$Intercept$	-0.02038***	-0.01956***	-0.01928***
	(-9.09)	(-8.72)	(-8.60)
$OR^{U}_{i,t+1}$	-0.00412	-0.00873	-0.00844
	(-0.54)	(-1.14)	(-1.37)
$OR^{D}_{i,t+1}$	-0.07925***	-0.02669***	-0.01418***
	(-12.83)	(-4.29)	(-2.34)
$Leverage_{i,t+\tau-1}$	-0.06043***	-0.06192***	-0.06227***
	(-18.00)	(-18.43)	(-18.52)
$Size_{i,t+\tau-1}$	0.0231***	0.02281***	0.02272***
	(50.49)	(49.84)	(49.72)
$Price_{i,t+\tau-1}$	-0.03931***	-0.03921***	-0.03917***
	(-56.61)	(-56.44)	(-56.38)
$Liquidity_{i,t+\tau-1}$	0.06842***	0.06776***	0.06756***
	(16.12)	(15.96)	(15.91)
$Profit_{i,t+\tau-1}$	0.0342***	0.03452***	0.03458***
	(11.68)	(11.79)	(11.81)
$Dividends_{i,t+\tau-1}$	-0.09428***	-0.09358***	-0.09349***
	(-3.08)	(-3.06)	(-3.05)
$Earnings_{i,t+\tau-1}$	-1.6E-05	-1.2E-05	-1.1E-05
	(-0.14)	(-0.11)	(-0.09)
$Growth_{i,t+\tau-1}$	-0.0018***	-0.0018***	-0.0018***
	(-14.83)	(-14.84)	(-14.85)
$Tangibility_{i,t+\tau-1}$	0.03469***	0.0342***	0.03408***
	(9.89)	(9.75)	(9.71)
$NDTS_{i,t+\tau-1}$	0.22833***	0.22695***	0.22628***
	(9.69)	(9.63)	(9.60)
Adj R-square	0.0170	0.0165	0.0164
N	255,519	255,519	255,519

Chapter IV

The Robustness of the Explanatory Power of Delayed Credit Rating Changes

4.1 Introduction

Empirical tests and their results reported in Chapter III show that dummy variables, measuring gaps of expectations about delayed credit rating changes (DCRCs) between insiders and outsiders, significantly add explanatory power to the financing adjustments before the rating changes are announced by rating agencies. This chapter further investigates the robustness of the explanatory power of DCRCs by conducting a series of tests and incorporating the DCRC hypotheses within the tests of the existing capital structure theories. The study demonstrates the DCRCs' explanatory power and finds that DCRC's influences on capital structure could be partially incorporated into the Pecking-order Theory.

This chapter first adjusts potential test problems which may be caused by OLS regressions in the previous chapter. The logit model examines the binary decisions of issuing debt or equity instead of testing the magnitudes of increases of debt and equity issuance. The influences of significant outliers are adjusted by the regressions cut outliers out of 3 standard deviations and by an alternative estimation, MM estimation, which cures the outliers' effects. Time and industry effects are tested by the mixed model which tests the variances of time and industries. Secondly, this chapter discusses the extent to which the findings are consistent with the existing theoretical models of capital structure by incorporating the DCRC dummies into the existing capital structure theory tests.

Classical capital structure theories have been developed over several past decades, but at best existing theories can explain certain facts of the diversity and complexity of financing choices (Margaritis and Psillaki (2010)). The questions

'How do firms finance their business?', 'What factors influence firm's financing choices?' have guided research in the area for a long time. Weston (1955) felt the need to argue whether it was possible to develop reasonable theories about these matters since experts cannot arrive at a conclusive answer. The Modigliani–Miller theorem (M&M, henceforth) (1958) forms the basis for modern thinking on capital structure. The theorem basically states that, under a certain market price process (the classical random walk), in the absence of taxes, bankruptcy costs, agency costs, and asymmetric information, and in an efficient market, the value of a firm is unaffected by how the firm is financed. It argues that it does not matter if the firm's capital is raised by issuing stock or selling debt, or what the firm's dividend policy is. Therefore, the Modigliani–Miller theorem is also often called the capital structure irrelevance principle.

Following the M&M proposition (1958), researchers' efforts on explaining financing behaviours have been turned into various market 'imperfections' in reality: for instance, the presence of taxes, bankruptcy, agency costs, information asymmetry in the financial market. Ross (1977) discusses a firm's financing strategy when managers possess inside information. It argues the 'signalling' effect, the tendency for the stock market to respond negatively to announcements of new stock issues. Though the costs and benefits of signalling have not arrived at a unique answer about the usage of signalling tools and approaches over the recent decades, the theory seems to confirm the existence of large 'information cost' impacting financing choices in predictable ways (Myers, McConnell, Peterson, Roebuck, Soter, Stewart, *et al.* (1998)). Signalling was integrated with a firm's

financing decisions when the well-known Pecking Order Theory of financing was developed (Myers and Majluf (1984)).

The Trade-off theory refers to the idea that a company chooses how much debt finance and how much equity finance to use by balancing the benefits and costs of debt, and, in particular, offsetting the bankruptcy costs associated with debt against tax savings from debt. The original version of the Trade-off Theory grew out of the debate over the M&M theorem (Eckbo (2007)) and its classical version of the hypothesis goes back to Kraus and Litzenberger (1973). Often agency costs are also included in the balance of debt and equity. The empirical relevance of the Trade-off Theory has often been questioned. According to Miller (1977), taxes are generally large and certain, while bankruptcy is rare and has low dead-weight costs. He suggested that if the Trade-off Theory were true, then firms ought to have much higher debt levels than we observe in reality. Myers was a particularly fierce critic of the Trade-off Theory, who proposed the Pecking Order Theory with Nicolas Majluf in 1984. Despite such criticisms, the Trade-off Theory remains the dominant theory of corporate capital structure and is taught in the main corporate finance textbooks. The Dynamic Trade-off Theory extends the static theory into a time-varying scale, which claims that managers of firms are continuously optimizing the leverage ratio as to maximize the value of the firm. The dynamic versions of the model generally seem to offer enough flexibility in matching the data, contrary to the Miller (1977)'s argument, dynamic trade-off models are very hard to reject empirically. It makes the predictions of this theory a lot more accurate and reflective of that in practice.

The Pecking Order Theory is often set up as a competitor to the Trade-off Theory. It was first suggested by Donaldson in 1961 and was modified and documented by Myers and Majluf (1984). Due to asymmetric information, the theory predicts a strict order of financing, internal funds, debt and equity. It considers the unequal distributed information between firm managers and market outsiders. Since managers know more about their companies' prospects, risks and values than outside investors, the information asymmetry affects the choice between internal and external financing and between the issue of debt or equity. However, a crucial problem for the Pecking Order Theory is the use of equity financing. Strong evidence about too many equity issuances are discussed in Frank and Goyal (2003) and those about issuing equity at the wrong times are discussed in Fama and French (2005) and Leary and Roberts (2010).

Being discussed for decades, neither of the two theories won a preponderant victory on having better explanatory power in financing behaviour. Instead of finding one general universal theory, researchers turn their study perspectives to specialised theories based on different hypotheses. Fama and French (2002) criticize both the Trade-off Theory and the Pecking Order Theory in different ways. Myers (2001) argues that a satisfactory unifying model is unlikely to be seen available in the near future. The market's imperfections and the theory's discussions based on them show that each theory has its strengths as well as downside, which is the limit of each theory's serviceable range. None of the theories has an overwhelming advantage over the other. Different models have problems with different facts. The lack of discussion on comparable test power

using different hypotheses for various theories could lead to weak and vague conclusions.

This chapter extends Chapter III in many ways. Firstly, by conducting various robustness checks, this chapter further confirms the added explanatory power of financing strategy driven by DCRCs. Secondly, the test evidence shows that DCRC related hypotheses could be partially incorporated into the existing capital structure theories, particularly the theories which have strong assumptions on information asymmetry. Last but not least, this chapter confirms the explanatory power of DCRC in the context of market insiders' capital structure adjustment behaviours.

The rest of the chapter is arranged as follows: Section 4.2 introduces data and gives summary statistics. Section 4.3 runs the robustness check on DCRCs explanatory power by carrying out various tests. Section 4.4 examines whether and how DCRC arguments are embedded into the existing theories of capital structure. Section 4.5 concludes.

4.2 Data and Summary Statistics

Data is collected from quarterly firm financials and monthly Standard & Poor (S&P) rating data from Compustat North America, which comprises more than 30,000 active and inactive publicly listed firms in the U.S. and Canada. Quarterly rating change indicators are derived from the monthly rating data[44] and amalgamated with the quarterly financial data. The sample covers all firms which have quarterly

[44] Values of *monthly* rating change indicators are summed up for every quarter and the *quarterly* rating indicators are defined as '1' if the sum of the added *monthly* value is greater than 0, otherwise defined as '0'. This means that the *quarterly* rating indicator is equal to '1' when rating changes take place in any month of the quarter, while it is equal to '0' when rating changes do not take place in any month of the quarter.

financial data and at least one rating record during the sample period: Q1 1985 (when the rating data begins in Compustat) to Q4 2010. The firm-quarter observations with negative equity (leverage greater than one) are excluded. The final sample for empirical tests excludes utility companies (SIC 4000-4999) and financial companies (SIC 6000-6999) as with conventional treatments.

4.2.1 Dependent Variables

This chapter examines the effects on *debt issuance*, *equity issuance* and *net debt issuance*, which are defined as follows:

$\Delta det_{i,t} = \frac{\Delta D_{i,t}}{A_{i,t-1}}$: *debt issuance*, where $\Delta D_{i,t}$ is long-term debt issuance (Compustat DLTISY) [45] minus long-term debt reduction (Compustat DLTRY) plus changes in current debt (Compustat DLCCHY) for firm *i* in quarter *t*, and $A_{i,t-1}$ is total asset (Compustat ATQ) of firm *i* in quarter *t-1*.

$\Delta eqt_{i,t} = \frac{\Delta E_{i,t}}{A_{i,t-1}}$: *equity issuance*, where $\Delta E_{i,t}$ is the sale of common and preferred stock (Compustat SSTKY) minus purchases of common and preferred stock (Compustat PRSTKCY) for firm *i* in quarter *t*.

$\Delta net_{i,t} = \frac{\Delta D_{i,t} - \Delta E_{i,t}}{A_{i,t-1}}$: *net debt issuance* (as in Kisgen (2006)) is the difference between $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$.

[45] The last letter 'Y' in DLTISY indicates that the variable is year-to-date. All variables comprised of year-to-date data are derived to quarterly values.

Looking further into details of *debt issuance* and examining the effects of short-term debt and long-term debt respectively, the two variables are defined as below:

$\Delta Sdet_{i,t} = \frac{\Delta SD_{i,t}}{A_{i,t-1}}$, where $\Delta SD_{i,t}$ is the change in current debt (Compustat DLCCHY) for firm *i* in quarter *t*.

$\Delta Ldet_{i,t} = \frac{\Delta LD_{i,t}}{A_{i,t-1}}$, where $\Delta LD_{i,t}$ is long-term debt issuance (Compustat DLTISY) minus long-term debt reduction (Compustat DLTRY) for firm *i* in quarter *t*.

4.2.2 Indicators for Upgrade and Downgrade

In order to indicate ratings upgrade and downgrade for firm *i* in quarter *t*+1, two sets of dummy variables are constructed. Each set consists of four dummy variables associated with the S&P ratings of long-term debt, short-term debt, subordinated debt and common stock. They are, respectively, Domestic Long-Term Issuer Credit Rating (Compustat SPLTICRM), Domestic Short-Term Issuer Credit Rating (SPSTICRM), Subordinated Debt Rating (SPSDRM) and Common Stock Ranking (SPCSRM)[46].

$LTD^{U}_{i,t+1}, STD^{U}_{i,t+1}, SUB^{U}_{i,t+1}, and\ Equity^{U}_{i,t+1}$: dummy variables for ratings upgrade. They are equal to 1 if the individual ratings of SPLTICRM, SPSTICRM, SPSDRM and SPCSRM of firm *i*, respectively, are upgraded in quarter *t+1*.

[46] This indicator provides investors predicted direction of future market risk. It provides 'investors with a measure of risk, a ranking change may signify a change in risk' (Felton, Liu and Hearth (1994)). However, it is not a rating for fixed income securities like bonds. It thus has different features with the other three rating indicators. Therefore it is excluded from *overall* rating change indicators defined below but report its individual influence on firm financing with the other three rating indicators when testing individual rating effects.

$LTD^{D}_{i,t+1}, STD^{D}_{i,t+1}, SUB^{D}_{i,t+1}$ *and* $Equity^{D}_{i,t+1}$: dummy variables for ratings downgrade. They are equal to 1 if the individual ratings SPLTICRM, SPSTICRM, SPSDRM and SPCSRM of firm *i*, respectively, are downgraded in quarter *t+1*.

To simplify the robustness check in this chapter, two dummy variables to indicate the *overall* rating upgrade and downgrade are conducted. It is based on the plausible assumption, which has been demonstrated in the previous chapter, that firm managers are not only concerned about a change in any of the above three ratings, but also about an overall outcome of the firm's future ratings.

$OR^{U}_{i,t+1} = 1$ if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing upgrade, and (ii) more individual ratings show upgrade than downgrade.

$OR^{D}_{i,t+1} = 1$ if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing downgrade, and (ii) more individual ratings show downgrade than upgrade.

4.2.3 Control Variables

Control variables, conventionally considered in capital structure studies[47], include *Leverage, Size, Price, Liquidity, Profit, Dividends, Earnings, Growth, Tangibility*

[47] Kisgen (2006) shows significant negative relation between *Leverage* and debt issuance. Titman and Wessels (1988) show that firm *Size*, as indicated by logarithm of sales, is one of the crucial determinants of capital structure. Marsh (1982) shows that changes in security *Prices* alter debt/equity ratios. Wald (1999), Myers (2001), and Fama and French (2002) demonstrate that *Profit* is an important factor that affects capital structure. Market-to-book ratio (defined as *Growth* in this study) and *Tangibility* are variables affecting leverage ratio in

and *NDTS (non-debt tax shields)* to separate their influences from DCRCs on firms' financing decisions.

$Leverage_{i,t}$: ratio of the sum of short-term debt (*Sd*) (Compustat DLCQ) and long-term debt (*Ld*) (Compustat DLTTQ) to the sum of short-term debt, long-term debt, and stockholders' equity (Compust LSEQ minus LTQ) for firm *i* in quarter *t*.

 : logarithm of sales (Compustat SALEQ) for firm *i* in quarter *t*.

$Price_{i,t}$: logarithm of the quarterly close price in the quarter (Compustat PRCCQ) for firm *i* in quarter *t*.

$Liquidity_{i,t}$: ratio of cash and cash equivalent (Compustat CHEQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

 $Profit_{i,t}$: ratio of EBITDA[48] to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Dividends_{i,t}$: ratio of dividends (Compustat DVY) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Earnings_{i,t}$: ratio of retained earnings (Compustat REQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Growth_{i,t}$: ratio of total debt book value plus quarterly close price (Compustat PRCCQ) multiplied by outstanding common stock

Rajan and Zingales (1995). *Dividends* (Barclay, Smith and Watts (1995) and Titman and Wessels (1988)) and *Earnings* (Titman and Wessels (1988)) policy tightly relate to debt issuance and equity sale. *Liquidity* (see Kim, Mauer and Sherman (1998)) is included to control for possible impact on leverage from firm's cash/liquidity positions and *NDTS* (*non-debt tax shields*), which is considered as an impact of optimal leverage level (DeAngelo and Masulis (1980) and Bradley, Jarrell and Kim (1984)) and may have negative influence on leverage.

[48] $EBITDA_{i,t}$ is the earnings before interest, tax, depreciation and amortization for firm *i* at time *t*, which is calculated as the sum of Pretax Income (Compustat PIQ), Inertest Expense (Compustat TIEQ) and Depreciation and Amortization (Compustat DPQ).

shares (Compustat CSHOQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Tangibility_{i,t}$: ratio of property plant and equipment (Net) (Compustat PPENTQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$NDTS_{i,t}$: ratio of deferred taxes and investment tax credit (Compustat TXDITCQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

4.2.4 Variables for Testing Existing Theories

In order to conduct regressions examining DCRC's effects in the context of existing capital structure theories, a few new variables are introduced. *DEF* is defined in Shyam-Sunder and Myers (1999) to test the Pecking Order Theory. It is designed to indicate the internal funds. $\Delta leverage_{i,t}$ indicates the changes in leverage and is created to test the Market Timing Theory. $\Delta earnings_{i,t}$ is also applied in the Market Timing Theory as an indicator of changes in retained earnings. These variables are defined as below:

$DEF_{i,t}$: the sum of dividend payments (Compustat DVY), capital expenditures (Compustat CAPXY), the net increase in working capital (Compustat WCAPCHY) and the current portion of long-term debt less operating cash flows, after interest and taxes (Compustat LTDLCHY-OANCFY) for firm *i* in quarter *t*.

$\Delta leverage_{i,t} = Leverage_{i,t} - Leverage_{i,t-1}$, where $Leverage_{i,t}$ is the same as that defined in the control variable section 4.2.3.

$\Delta earnings_{i,t} = Earnings_{i,t} - Earnings_{i,t-1}$, where $Earnings_{i,t}$ is the same as that defined in the control variable section 4.2.3.

4.2.5 Summary Statistics

Table 4.1 shows the summary statistics for the sample containing 343,096 firm-quarters. Firms on average issue more equity (normalized by total assets) of 0.033 than debt (normalized by total assets) of 0.01. The net debt issuance is negative at -0.04. The short-term debt and long-term debt are on average both 0.005 but the former is more volatile than the latter.

[Insert Table 4.1 here]

The average firm has a *Leverage* ratio of 0.278, a *Size* of 3.660, a *Price* of 1.984 and a *Growth* (Market-to-Book ratio) of 2.229. Other control variables are all normalized by firm's total assets. The average firm holds 17.8% of its total asset value as cash and cash equivalent (short-term investments) and distributes 0.2% of its total asset value as dividends one quarter ahead of rating changes. Firms on average have negative *Profit* (-0.009) and negative retained *Earnings* (-1.642). The average firm holds approximately 28.6% of its book value of assets in fixed assets and has the ratio of 1.9% deferred taxes and investment tax credit to total assets.

The newly added variables in this chapter for the tests incorporating DCRCs into the existing capital structure theories are *DEF,* $\Delta leverage$ and $\Delta earnings$, which have average values of -2.730, 0.003 and 0.090, respectively. It indicates that the internal funds are negative and both leverage and earnings increased across the sample.

4.3 Robustness Check of DCRC's Effects

This section evaluates the robustness of the tests in Chapter III by performing a number of tests and analyses. The tests start from a logit model examining the binary decisions of issuing debt or equity instead of testing the magnitudes of adjustments in debt and equity issuance in the previous chapter. The result show that the dramatic gap between the residuals' distribution and normal distribution is shown when investigating the distribution of residuals gained from OLS regressions in the previous chapter. Therefore, the regressions deleting outliers are conducted in this section. An alternative MM estimation is also conducted to check the robustness of the regression adjusting outliers' influences. Finally, the mixed model is run to test the variances of both time and industry dimensions.

4.3.1 Logit Tests on Debt Issuance and Equity Issuance

Logit tests could investigate the specific mechanisms by which effects of delayed rating changes are manifested by binary financing choices (Kisgen (2009)). Instead of testing the adjusted magnitudes of debt issuance and equity issuance due to DCRCs defined in the previous chapter, this chapter tests the binary choices. Debt issuance and equity issuance are defined as dummy variables $Idebtissue$ and $Iequityissue$ in this section to test issuers' financing choices.

$$Idebtissue_{i,t} = \begin{cases} 1, & \Delta det_{i,t} > 0 \\ 0, & otherwise \end{cases} \qquad Iequityissue_{i,t} = \begin{cases} 1, & \Delta eqt_{i,t} > 0 \\ 0, & otherwise \end{cases} \quad (4.1)$$

The logit models below are conducted to test issuer's dichotomous financing choices in the four periods around DCRCs:

$$ln\left(\frac{P(Idebtissue_{i,t+\tau}=1)}{1-P(Idebtissue_{i,t+\tau}=1)}\right) = \vartheta_0+\vartheta_1 OR^U_{i,t+1} + \vartheta_2 OR^D_{i,t+1} + \boldsymbol{\vartheta_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (4.2a)$$

$$ln\left(\frac{P(Iequityissue_{i,t+\tau}=1)}{1-P(Iequityissue_{i,t+\tau}=1)}\right) = \lambda_0+\lambda_1 OR^U_{i,t+1} + \lambda_2 OR^D_{i,t+1} + \boldsymbol{\lambda_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (4.2b)$$

(τ = -1, 0, 2, 3)

where $OR^U_{i,t+1}$ and $OR^D_{i,t+1}$ are the overall upgrade dummy and downgrade dummy respectively. $\boldsymbol{X_{i,t+\tau-1}}$ is the vector of control variables. The left-hand-sides of the equations (4.2a) and (4.2b) are the logits or log-odds[49]. The coefficients in the two logit models thus represent the change in the logit of the probability associated with one unit change in the corresponding predictor given all the other predictors constant. In particular, since the two equations above contain the dummy independent variables $OR^U_{i,t+1}$ and $OR^D_{i,t+1}$, the explanations of their corresponding coefficients are slightly different. For instance, ϑ_1 represents the difference in the logit of debt issuance between when $OR^U_{i,t+1}$ equals one and when it equals zero, more expressly, when there is a rating upgrade and when there is no rating upgrade in the next period.

Table 4.2 reports the coefficients and odds ratio estimates given by the logit regression. The first table 'Coefficient estimates of logit tests' gives the change in log odds of the dependent variable for a one unit increase in the independent variables[50]. The four panels in the coefficient estimates table of Table 4.2 show the

[49] Odds is the ratio of the probability that something is true devided by the probability that it is not true.

[50] Note that the generalized R^2 is calculated as $\boldsymbol{R^2 = 1 - \left|\frac{L(0)}{L(\hat{\theta})}\right|^{2/n}}$ and the upper-bound of the generalized R^2 is less than 1. Nagelkerke (1991) suggests the adjusted $\boldsymbol{\overline{R}^2 = \frac{R^2}{R^2_{max}}}$, which makes R^2 achieves a maximum value of one. $\boldsymbol{R^2_{max} = 1 - |L(0)|^{2/n}}$ $\boldsymbol{\overline{R}^2}$ is labelled as "Max-rescaled R-Square" in SAS PROC LOGISTIC result reports. (p.2342, SAS/STAT 9.1 User's Guide By SAS Institute, SAS Publishing Staff)

log odds of the four periods around DCRCs, respectively. The second table 'Odds ratio estimates of logit tests' lists the odds ratios, which are the exponentiation of the regression coefficients and can be interpreted as the multiplicative change in the odds for a one unit change in the independent variable.

[Insert Table 4.2 here]

Panel Bs of Table 4.2 list the results of regressions (4.2a) and (4.2b) one quarter before DCRCs are announced *($\tau = 0$)*. The coefficient estimates of equation (4.2a) give the log odds of debt issuance as listed in the first table of Table 4.2. The estimate on rating upgrade $OR^{U}_{i,t+1}$ is -0.1537 and is significant at the 5% confidence level while the estimate on downgrade $OR^{D}_{i,t+1}$ is 0.1150 and is significant at the 1% confidence level. As listed in the second table of Table 4.2, the corresponding odds of issuing debt (versus not issuing debt) thus significantly increases by a factor of 0.8575 (=$e^{-0.1537}$) before delayed upgrades are announced and significantly increases by 1.1219 (= $e^{0.1150}$) before delayed downgrades. This indicates that 'good' issuers tend not to issue debt while 'bad' issuers do the opposite before rating change are announced.

For the estimation of equation (4.2b) examining the probability of equity issuance, the estimated log odds of increasing equity issue before upgrades is 0.1686 and is significant at the 1% level while the estimate on downgrades is insignificant. The results suggest that only 'good' issuers increase the odds of equity issuance by 1.1686 before rating upgrades but 'bad' issuers do not significant modify the odds of equity issue before downgrades.

Panel A, C and D of Table 4.2 show the results of the other three quarters before and after DCRCs are announced *(τ = -1,2,3)*. The results in Panel A imply that 'good' issuers significantly issue equity but do not increase debt issuance while 'bad' issuers do not adjust their financings. Panel C indicates that only 'bad' issuers issue extra debt one quarter after DCRCs while issuers do not significantly adjust equity issuance in that quarter. Panel D indicates that 'bad' issuers prefer not to increase debt issuance two quarters after DCRCs while equity issuances would not be adjusted in this quarter as well.

Further extending the investigation to marginal effects, the complication arises because the independent variable often includes dummy variables, which indicate binary choice (Greene (2008)). For instance, the appropriate marginal effect for the binary independent variable $OR_{i,t+1}^{U}$ would be

$$Prob\left(Idebtissue_{i,t} = 1 \middle| \bar{x}_d, OR_{i,t+1}^{U} = 1\right) - Prob\left(Idebtissue_{i,t} = 1 \middle| \bar{x}_d, OR_{i,t+1}^{U} = 0\right)$$

where $\bar{x}_d$ denotes the means of all the control variables in equation (4.2a). The results of marginal effects for upgrade and downgrade indicators are reported in the third table of Table 4.2. For example, in the Panel B of the table, the marginal effects around the mean of control variables show that comparing with no rating change, the probability of debt issuance is 1.51% less when there is upgrade in the next period. In contrast, given other the same, the probability of debt issuance is 1.25% more one period before a downgrade than no rating change. Results of marginal effects listed in other three panels show that the probability differences between rating changes and no rating changes are all less than 0.5%.

In summary, the results of logit tests confirm the findings in the previous chapter, particularly the test results one quarter before DCRCs.

4.3.2 Outliers' Effects

This section discusses the outliers' effects in the OLS regressions in the previous chapter, in which regression (4.3) below has been tested.

$$\Delta net_{i,t} = \alpha_0 + \alpha_1 OR^{U}_{i,t+1} + \alpha_2 OR^{D}_{i,t+1} + \boldsymbol{\alpha_c X_{i,t-1}} + \varepsilon_{i,t} \quad (4.3)$$

However, as shown in Figure 4.1, the distribution of the residual $\varepsilon_{i,t}$ has significant negative skewness of -21.238 and extreme significant kurtosis of 1548.475, which is significantly different from the skewness of 0 and kurtosis of 3 for an OLS regression assuming a normal distribution of residuals. Three statistics examining normality for the residual $\varepsilon_{i,t}$ are adopted in this section: Kolmogorov-Smirnov[51], Cramér-von Mises and Anderson-Darling. The residuals gained from regression (4.3) with the full data sample has a 0.3077 Kolmogorov-Smirnov *D statistic,* a 3665.89 Cramér-von Mises W^2 *statistic* and a 18332.265 Anderson-Darling A^2 *statistic.* These statistics show big gaps from those of normal distribution. The extreme high kurtosis is normally due to infrequent and extreme deviations. The tests excluding outliers are thus conducted for the regression (4.3).

[Insert Figure 4.1 here]

[51] SAS programme uses the Shapiro-wilk test when the sample size is below 2000 and the Kolmogorov test when the sample size is above 2000. A low value of D statistic means that the EDF clings tightly to the reference Normal distribution's CDF and is therefore a good approximation of this cdf, an argument in favor of H0: Normal distribution.

Table 4.3 reports the results of regressions (4.4a) – (4.4c) with the sample excluding the outliers outside of 3 standard deviations (3SD henthforth)[52] of the full sample to test the robustness of results gained from OLS regressions in Chapter III.

[Insert Table 4.3 here]

$$\Delta det_{i,t+\tau} = \beta_0 + \beta_1 OR^U_{i,t+1} + \beta_2 OR^D_{i,t+1} + \boldsymbol{\beta_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (4.4a)$$

$$\Delta eqt_{i,t+\tau} = \gamma_0 + \gamma_1 OR^U_{i,t+1} + \gamma_2 OR^D_{i,t+1} + \boldsymbol{\gamma_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (4.4b)$$

$$\Delta net_{i,t+\tau} = \alpha_0 + \alpha_1 OR^U_{i,t+1} + \alpha_2 OR^D_{i,t+1} + \boldsymbol{\alpha_c X_{i,t+\tau-1}} + \varepsilon_{i,t+\tau} \quad (4.4c)$$

(τ =-1, 0, 2, 3)

Panel B of Table 4.3 shows the results one period before DCRCs *(τ =0)*. The *D statistic* decreases from 0.3077 of the full sample to 0.2044 of the new sample excluding 3SD outliers. The *W^2 statistic* for the tests based on the new sample decreases to 1848.63 and the *A^2 statistic* decreases to 9506.62. The skewness and kurtosis became -1.0121 and 21.2608 respectively, which are drastically corrected toward to the skewness and kurtosis of the normal distribution. The signs and significances of coefficient estimates on $\Delta net_{i,t}$, $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$ are consistent with the results of the tests based on the full data sample, indicating that the outliers do not play a crucial role in the estimation and did not contaminate the result when using full data sample and its indications. The test results also indicate that 'good' issuers do not change the net debt issuance while 'bad' issuer increase net debt issuance before delayed credit rating changes. The result remains robust when the dependent variable $\Delta net_{i,t}$ is broken into debt issuance $\Delta det_{i,t}$ and equity issuance $\Delta eqt_{i,t}$. The coefficients in regressions (4.4b) and (4.4c) indicate that 'good' issuers

[52] There is no rigid mathematical definition of what constitutes an outlier. Determining whether or not an observation is an outlier is ultimately a subjective exercise. I thus take the most commonly used way by excluding outliers outside of 3 standard deviations (SD). For example, $\Delta net_{i,t} \epsilon$ [-0.610, 0.590].

moderately increase equity issuance while 'bad' issuers significantly increase debt financing one quarter before DCRCs.

Panel A of Table 4.3 reports the results of two quarters before DCRCs *(τ =-1)*. The estimated values of the coefficients on the rating dummies in regressions (4.4a) – (4.4c) indicate issuers' financing adjustment behaviour two quarters before DCRCs. The only significant coefficient on rating dummies is that on downgrade in (4.4a), indicating that issuers facing rating downgrades after two quarters significantly increase the debt issuance while issuers do not adjust .

Panel C and D of Table 4.3 report the results in the quarters after DCRCs. In the first quarter after rating changes, 'good' issuers significantly increase debt issuance. 'Bad' issuers issue both debt and equity significantly at the 1% confidence level. In the second quarter after rating changes, 'good' issuers do not issue debt but significantly increase equity issuance. 'Bad' issuers increase both debt and equity issuances, but debt issuances are in a smaller scale than those in the last quarter. This is consistent with results based on the full sample, as shown in Table 3.2. The results in this section thus indicate that outliers outside of 3SD do not play a significant role in contaminating the test results.

4.3.3 MM Estimation

The robust regression [53], an important tool for analysing whether data are contaminated by outliers, is run in this section to detect the effects of outliers and to provide resistant (stable) results in the presence of outliers. Table 4.4 reports the

[53] The command used here is the PROC ROBUSTREG command in SAS. It attempts to 'retain the robustness and resistance of s-estimation, whilst gaining the efficiently of M-estimation' (SAS (2004)).

MM estimation[54] results for robust regressions in the four quarters around DCRCs. The 'Deviance' reported in the bottom of the table is a measure of 'goodness of fit' between the observed and the estimated values. The smaller the *Deviance*, the better the fit of the model. The percentages of outliers detected in the four panels vary from 9.41% to 15.01%, which is much higher than the percentage of outliers excluded in Section 4.3.2[55].

[Insert Table 4.4 here]

Panel B of Table 4.4 indicates that a future upgrade predicts an insignificant change on net debt issuance but a future downgrade predicts a higher probability of debt issue and insignificant equity issuance. These results suggest that 'good' issuers tend not to significantly modify financing plan one quarter before DCRCs while 'bad' issues employ more net debt issuance by 0.21% as the percentage of total asset. These results are consistent with the conclusion in the previous chapter and sections.

Panel A of Table 4.4 shows that both coefficients on upgrade and downgrade are significant at the 1% level, indicating that the action of financing adjustments take place two quarters before DCRCs. The negative coefficient on upgrade implies that 'good' issuers start to decrease net debt issue two quarters before DCRCs. The coefficients are also significant when independent variable net debt issue is broken into debt issue and equity issue. The -0.0012 coefficient and 0.0001 coefficient indicate that 'good' issues decrease debt issue but slightly increase equity issue

[54] MM estimation is a combination of high breakdown value estimation and efficient estimation (M estimation) introduced by Yohai and Zamar (1987).
[55] For instance, the percentage of outliers excluded in Panel B of Table 4.2 is only 0.98% (= (114,970 - 113,835)/114,970).

before rating upgrades. In contrast, the 'bad' issuers significantly increase debt issue but do not adjust equity issue before rating downgrades.

To summarize the issuers' behaviours before DCRCs, 'good' issuers and 'bad' issuers commence to modify financing plan at least one quarter before rating change news is disclosed by rating agencies. The result strongly supports the test results of *Hypothesis 3.1* and *Hypothesis 3.2* in Chapter III.

Panel C and D of Table 4.4 show the results of the first and second quarter after DCRCs, respectively. Column 1, Panel C shows that the coefficient on upgrade is 0.0016 and significant at the 10% level while the coefficient on downgrade is not significant when testing DCRC's effects on net debt issue. These estimates imply that 'good' issuers slightly increase net debt issuance one quarter after DCRC while 'bad' issuers do not adjust the net debt issue. Panel D shows that the coefficient on upgrade is insignificant while that on downgrade is negative and significant at the 1% level. The coefficient of 'bad' issuers on debt issue is also negative and significant at the 1% level. These results indicate that 'bad' issuers decrease debt issue two quarters after rating downgrades. In brief, the results of outliers-cut regressions show that outliers do not contaminate the overall results.

4.3.4 Time and Industry Effects

To test the time and industry effects, the *mixed linear model* is evaluated in this section (Random coefficient model (ML) is applied in SAS). It is a generalization of the standard linear model used in the GLM procedure and also provides the flexibility of modelling not only the means of data (as in the standard linear model)

but also their variances and covariances. The model could be briefly summarized as follows:

$$\Delta det_{i,t+\tau} = \beta_0 + \beta_1 OR^U_{i,t+1} + \beta_2 OR^D_{i,t+1} + \boldsymbol{\beta_c X_{i,t+\tau-1}} + {\omega_1}^d time + {\omega_2}^d SIC + \varepsilon_{i,t+\tau} \quad (4.5a)$$

$$\Delta eqt_{i,t+\tau} = \gamma_0 + \gamma_1 OR^U_{i,t+1} + \gamma_2 OR^D_{i,t+1} + \boldsymbol{\gamma_c X_{i,t+\tau-1}} + {\omega_1}^e time + {\omega_2}^e SIC + \varepsilon_{i,t+\tau} \quad (4.5b)$$

$$\Delta net_{i,t+\tau} = \alpha_0 + \alpha_1 OR^U_{i,t+1} + \alpha_2 OR^D_{i,t+1} + \boldsymbol{\alpha_c X_{i,t+\tau-1}} + {\omega_1}^n time + {\omega_2}^n SIC + \varepsilon_{i,t+\tau} \quad (4.5c)$$

(τ =-1, 0, 2, 3)

where $({\omega_1}^d, {\omega_2}^d)$, $({\omega_1}^e, {\omega_2}^e)$ and $({\omega_1}^n, {\omega_2}^n)$ are unknown vectors of random-effects parameters with known *time* and *SIC* (the indicator of industry), whose effects are assumed to be normally distributed with zero mean and some unknown variances. $\varepsilon_{i,t+\tau}$ is an unknown random error vector whose elements are no longer required to be independent and homogeneous as that in OLS regressions.

The panel data sample consists of 104 quarters and 369 industries (by 4-digit SIC code). Both the time and industry are assumed to cause the random variability in this study. Table 4.5[56] reports the results of the mixed linear model, which gives the time and industry effects. The results mainly show two features. Firstly, the test results listed in Panel B of Table 4.5 show that the coefficient estimates are close to those gained from OLS tests in the previous chapter for the period, one quarter before DCRC. This indicates that the OLS test results are robust in the quarter. Secondly, the covariance parameters indicate the random effects from the two dimensions. Comparing the variances of random time effects and variances of random industry effects, the variances of residuals are generally hundreds or

[56] The PROC MIXED command in SAS applied to the mixed linear model estimation does not report R square. The firm effects are not tested here since there are 10,298 individual firms and the programme could not gain the results.

thousands times higher in the four panels. This indicates that the time and industry variation effects are not significant.

[Insert Table 4.5 here]

In particular, the results in Panel B of Table 4.5 show that 'bad' issuers increase net debt issuance before DCRC by 0.91% at the 10% level while 'good' issuers do not show significantly adjust net debt issuance one quarter before DCRCs. Panel A of Table 4.5 lists the result in the two quarters before DCRCs and the results show that neither the 'good' issuers nor the 'bad' issuers increases net debt issuances significantly.

Panel C of Table 4.5 indicates that 'good' issuers moderately increase their net debt issuance while 'bad' issuers do not show significant behaviour on adjusting financing in the first quarter after DCRCs. The results show 'good' issuers' insignificant adjustment on financing and 'bad' issuers' decrease of net debt issuance in the second quarter after DCRCs as reported in Panel D of Table 4.5. The results of the last two quarters are consistent with those in the previous chapter after excluding outliers.

The results of the mixed linear model imply issuers demonstrate similar behaviour with those in OLS regressions conducted in Chapter III. Furthermore, the relatively small variances of time and industry indicate that both time and industry effects are very small in the four panels. Overall, the results of estimation of the mixed linear model imply that issuers' behaviours are consistent with that indicated by the results gained from the OLS regressions one quarter before DCRCs. The time and industry do not show significant variances.

4.4 DCRCs in the Context of Existing Capital Structure Theories

So far, the evidence reported in the previous sections strongly support the hypotheses that DCRCs have considerable significant effects on issuer's financing behaviours, however, this does not appear to be fully explained by traditional capital structure theories. In this section, tests are conducted to evaluate whether the DCRC's effects investigated in the previous sections could be explained by existing capital structure theories and whether DCRC adds extra explanatory power to the existing theories of capital structure when it is nested into previous capital structure theory tests.

'There is no universal theory of the debt-equity choice and no reason to expect one' (Myers (2001)). The three classical capital structure theories, however, are conditionally useful to explain manager's financing strategies and tactics in different circumstances. For example, the *Trade-off Theory* indicates that firms seek the optimal debt level which balances the tax advantages of additional debt against the cost of possible financial distress and thus predicts reversion of the actual debt ratio to its target. Particularly designed for inefficient market with the market imperfection of information asymmetry, the *Pecking Order Theory* states that given insufficient internal cash flow to fund growth opportunity, the firm follows a hierarchy ranking of financing sources: from internal (less risky) to external (riskier) funds. The *Market Timing Theory* states that 'capital structure evolves as the cumulative outcome of past attempts to time the equity market' (Baker and Wurgler (2002)). It indicates that firms prefer external equity when the cost of equity is low,

and otherwise prefer debt. Taking the warning of Myers (2001) that 'the words *consistent with* are particularly dangerous in the branch of empirical financial economics', this section takes the efforts to imbed the DCRC assumption with various theories in capital structure, which may help to comprehensively explain different aspects of DCRC's influence on financing decisions.

4.4.1 The Trade-off Theory

To carry on the empirical regression testing the *Trade-off Theory*, Shyam-Sunder and Myers (1999) (SSM henceforth) are employed to test whether managers seek optimal leverage and revert back to the target leverage when it flows away from the optimal level. Replicating SSM and referring to the test in Kisgen (2006), which incorporates credit rating factor into traditional capital structure tests, TLD_i is defined as the optimal target long-term debt level for firm *i*. Two models below are estimated: (4.6a) tests the Trade-off Theory while (4.6b) nests DCRC into the theory's test.

$$\Delta Ldet_{i,t} = a + b\frac{(TLD_i - Ld_{i,t-1})}{A_{i,t-2}} + \varepsilon_{i,t} \quad (4.6a)$$

$$\Delta Ldet_{i,t} = a + d_1 OR^{U}_{i,t+1} + d_2 OR^{D}_{i,t+1} + b\frac{(TLD_i - Ld_{i,t-1})}{A_{i,t-2}} + \varepsilon_{i,t} \quad (4.6b)$$

where $\Delta Ldet_{i,t}$ is the long-term debt issuance normalized by total asset for firm *i* at time *t*. $Ld_{i,t}$ is the book value of long-term debt firm *i* at time *t.* Due to the unobservable TLD_i, the historical mean of the debt ratio for each firm is set as the proxy of the optimal target debt ratio (Targgart (1977)) according to the predominate approach, such as that used in SSM[57]. The null hypothesis to be tested

[57] As Myers *et al.* (1998) mentioned that 'a proportion of debt to equity that management aims to achieve, if not

is $b>0$ indicating adjustments towards the target debt level, and $b<1$ indicating positive adjustment costs. If trade-off theory is correct and DCRC does not function, the coefficient $0<b<1$ while d_1 and d_2 are both expected to be 0. DCRC assumption implies that 'good' issuers anticipating future rating upgrades may be more inclined to disclose their positive perspective to the market and thus keep net debt issuance unchanged. In contrast, 'bad' issuers facing downgrades in the next period intend to give the priority to the low cost of capital financing. The predictions in regression (4.6a) and (4.6b) thus are: d_1 is not significant while d_2 is positive and significant.

The regressions (4.6a) and (4.6b) are tested with the same sample from the previous chapter, excluding financial firms (SIC 6000-6999) and utility firms (SIC 4000-4999). Column 1, Panel A of Table 4.6 shows the results of (4.6a) testing only the Trade-off Theory without nesting DCRCs, it obtains an insignificant *b*. Column 2, Panel A of Table 4.6 provides results of regression (4.6b) nesting DCRC dummy variables into the trade-off tests. It shows that the effect of delayed rating upgrade remains insignificant and that of delayed rating downgrades are positive on long-term debt issue and statistically significant at the 1% level as predicted. These results imply the same features of financing adjustments gained in the previous chapter. The target adjustment coefficient, *b*, is insignificant with *t-statistic* of 0.39. The insignificant *b* in the two tests reported in Panel A of Table 4.6 does not support the DCRC assumption in the context of trade-off theory.

[Insert Table 4.6 here]

at all times, then at least as a long-run average' , the long-term average of debt to asset ratio is thus considered as the target level.

This is in accordance to Professor Stewart Myers's statement 'Stop searching for optimal capital structure' recorded in Myers *et al.* (1998). Literature and surveys provide also give some clues. For instance, Myers (1984) questions the trade-off story since debt ratios vary widely across similar firms and the study argues that debt ratio 'targets depend on factors not yet recognized or understood'. Graham and Harvey (2001)'s survey shows that firms only aim at 'soft' leverage targets rather than rigid levels.

Panel B of Table 4.6 shows the estimated results of the regression (4.7), which investigates the trade-off effects in the other three quarters around DCRCs announcements. The target adjustment coefficients, *b*, are not significant in all four periods around DCRCs[58]. The results in Panel B do not imply the appearance of trade-off effects when nesting DCRCs but still show strong support of DCRC's effects on financing adjustments since the coefficients on rating dummies are significant in the quarters around DCRCs.

$$\Delta Ldet_{i,t+\tau} = a + d_1 OR^{U}_{i,t+1} + d_2 OR^{D}_{i,t+1} + b\frac{(TLD_i - LD_{i,t+\tau-1})}{A_{i,t+\tau-2}} + \varepsilon_{i,t+\tau} \quad (4.7)$$

(τ =-1, 0, 2, 3)

One of the vital reasons for DCRC's assumed incompatibility with the *Trade-off Theory* could be that the theory retains the assumptions of market efficiency and symmetric information, although it includes various imperfections which are not considered in Modigliani and Miller (1958). The DCRC assumption test, however, is fundamentally based on the condition of information asymmetry. It thus may not fit in well with a theory based on market perfections.

[58] The result of the test when τ *=0* is the same with that in Column 2, Panel A of Table 4.6. The test examines the effect one quarter before DCRC.

4.4.2 The Pecking Order Theory

The study in the previous chapter shows that 'good' issuers tend to break the hierarchy suggested in the *Pecking Order Theory* while 'bad' issuers seem to follow the order around the periods of rating changes. Some distinguished literature argues that firms appear more likely to follow the *pecking order*'s financing hierarchy when information asymmetry is high, where the adverse selection could be more severe (Myers and Majluf (1984), and Bharath, Pasquariello and Wu (2009)).

Proceeding as before, replicating SSM regression for the *Pecking Order Theory*, which tests whether firms issue debt when internal cash flows are inadequate for investment and dividend commitments. Deficit in funds *DEF* is introduced in the regression and defined as the sum of dividend payments, capital expenditures, net increase in working capital and the current portion of long-term debt less operating cash flows, after interest and taxes (Kisgen (2006)). Incorporating rating change indicators, SSM tests are modified as below:

$$\Delta Ldet_{i,t} = a + b\frac{DEF_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \tag{4.8a}$$

$$\Delta Ldet_{i,t+\tau} = a + g_1 OR^{U}_{i,t+1} + g_2 OR^{D}_{i,t+1} + b\frac{DEF_{i,t+\tau}}{A_{i,t+\tau-1}} + \varepsilon_{i,t} \tag{4.8b}$$

$$(\tau = -1, 0, 2, 3)$$

The *Pecking Order Theory* requires that all externally financed funds fill the deficit gap, which implies that *b* is close to 1 and *a* equals to 0. The lower the value of b is, the smaller the information asymmetry. The DCRC assumption implies that g_1 is not significant while g_2 is positive and significant one period before DCRCs ($\tau = 0$). If the pecking order model is correct and DCRC does not have effects on

issuers' financing, g_1 and g_2 should be equal to 0. The equations are tested with the sample of firms from the previous chapter, additionally excluding firm-quarters whose *DEF* are missing.

Column 1, Panel A of Table 4.7 shows the estimate results of equation (4.8a) testing a pure pecking order model without nesting DCRCs. The coefficient on the deficit *DEF* is 0.0034 and is significant at 10% level (*t=14.81*). This value is much smaller than the 0.75 coefficient found in SSM and 0.28 in Frank and Goyal (2003). However, its significance suggests that the *Pecking Order Theory* could stand weakly with the sample in the study and when DCRCs are nested. Both Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) employ firm-year data while this study applies firm-quarter data. The longer periods examined in literatures may cause more significant changes of debt issue over the whole financial year, thus derive a higher *b*. Also, this study applies the most recent data ending Q4 2010, when the information asymmetry has been decreasing gradually throughout the 26 year peirod. Appendix 5 reports the changes in every five years periods, which shows the decreasing estimates of *b* in regression (4.8b): from 0.2089 to 0.0050. However, the five coefficients are all significant at the 1% level. The result indicates that information asymmetry is significant throughout the past decades, however, it is likely to be less severe in the sample years.

[Insert Table 4.7 here]

Column 2, Panel A of Table 4.7 shows the results including both the DCRC dummy variables and the *DEF* term (equation (4.8b) when $\tau = 0$). This test provides statistical significance for the dummy variable $OR_{i,t+1}^{D}$ and the predicted sign. This

indicates that the DCRC has added power in the pecking order test. The coefficient on *DEF* remains the same as that in Column 1, indicating that pecking order remains with DCRC effects.

Panel B of Table 4.7 shows the regressions for the rest of the three periods around DCRCs (when τ = *-1, 2, 3*). The coefficients of the deficit *DEF* are all positive and significant in the three periods when nesting DCRCs. The coefficient estimate is 0.0050 with *t-statistic* of 17.51 in the period two quarters before DCRC. The coefficient estimates are both 0.0002 with *t-statistic* of 2.33 in the two quarters after DCRC. This means that long-term debt issue is positively related to the firm's financial deficit. The deficit always motivates issuers to borrow more in general though the scale of borrowing significantly decreases after rating changes. The coefficients on rating dummies show features similar to those in previous sections. These results partly support DCRC in the context of the pecking order theory.

It should be noted that none of the pecking order coefficients is close to 1. These results imply that pecking order only partly stands when nesting DCRCs in the four periods. Credit rating changes are not exogenous (Kisgen (2009)). Ang and Cheng (2011) argue that firms could choose to mitigate information asymmetry endogenously via superior communication, therefore alleviate information costs and constraints on financing decisions. This could be one of the reasons explaining the partial fail of pecking order hypothesis when information asymmetry is not significant. The self-controlled information release style particularly benefits the 'good' issuers, who are more likely to choose to release information comprehensively and swiftly to rators. In contrast, 'bad' issuers may accrue substantial rewards for exaggerating positive qualities (Leland and Pyle (1977)).

They follow the hierarchy because the asymmetric information plays an important role for their financing. They are thus strongly motivated to hold back bad news from public investors and rators and take advantage of the information asymmetry before downgrades are released by rators in the next period. Secondly, 'good' issuers' attempts to issue debt is prevented by the cost from possible further delayed release of upgrade news and the cost of more expensive debt, they thus contradict the pecking order. An explanation looking at the other method of financing, equity financing, is given by Fulghieri and Lukin (2001), which shows that equity, the more information-sensitive security, is more likely to be issued by a firm wishing to raise funds for an investment project if the cost of producing information is relatively low.

Panel B of Appendix 5 shows the evidence by filtering the test sample into three different types of DCRCs. The coefficient on *DEF* for 'bad' issuers ($OR_{i,t+1}^{D}$=1) is significant and is the highest (0.44) among the three *DEF* estimates for the three subsamples (the other two samples are $OR_{i,t+1}^{U}$=1 and no rating changes, i.e., $OR_{i,t+1}^{U}$=$OR_{i,t+1}^{D}$=0). The results indicate that 'good' issuers do not follow pecking order while 'bad' issuers follow it.

4.4.3 The Market Timing Theory

Market timing appears to be an important aspect of real financial policy and in recent studies (Baker and Wurgler (2002)) is shown to cause substantial and persistent effects on capital structure. The importance and function of *equity market timing* are admitted by managers in Graham and Harvey's (2001) anonymous survey. Jenter, Lewellen and Warner (2011) find that managers successfully time

the market. Managers have the incentive to time the market if they think it is possible to achieve and if they care more about their current shareholders than about prospective and exiting ones. They generally choose to issue equity when the market value is high relative to its fair value[59]. Also, the previous regression results testing DCRCs' effects on issuers' financing plans around the periods of rating changes show that issuers do time the market to issue securities in order to balance costs and benefits.

To determine whether the DCRC hypotheses persist in the context of *Market Timing Theory*, the modified regression (4.9a) of the regression created in Baker and Wurgler (2002) (BW henceforth) are designed by nesting DCRC hypotheses[60] into the market timing tests. BW tests hypothesize that market-to-book ratio may be related to investment opportunities[61] and market mispricing, and is thus the main determinant of changes in leverage. Specifically, high investment opportunities tend to push leverage toward to a higher debt capacity (Baker and Wurgler (2002)). The *Market Timing Theory* detects the significant influence of market-to-book ratio on change in leverage, which indicates the timing of firms' market behaviour.

Equation (4.9a) regresses the change in leverage against the DCRC dummies and the main focus market-to-book ratio, as well as against a set of benchmark control variables. To examine which factors drive the leverage change effect, as the *market timing theory* implies, the equation (4.9b) decomposes the change in leverage into three components: equity issuance as the percentage of total asset

[59] Graham and Harvey (2001) find that two-thirds of CFOs agree that 'the amount by which our stock is undervalued or overvalued was an important or very important consideration' in issuing equity.
[60] Baker and Wurgler (2002) adopt daily and yearly data in the tests while here quarterly data is used.
[61] The Pecking Order Theory regards the market-to-book ratio as a measure of investment opportunities (Baker and Wurgler (2002)).

$\frac{\Delta E_{i,t+\tau}}{A_{i,t+\tau}}$, changes in retained earnings as the percentage of total asset $\frac{\Delta earnings_{i,t+\tau}}{A_{i,t+\tau}}$ and the residual change in leverage $E_{i,t+\tau-1}\left[\frac{1}{A_{i,t+\tau}}-\frac{1}{A_{i,t+\tau-1}}\right]$. Each of the three components in equation (4.9b) are employed as dependent variables, which regresses against the rating dummies and market-to-book ratio as well as other independent variables to determine whether market-to-book ratio has an effect through any of these three components.

$$\Delta leverage_{i,t+\tau} = \theta_0+\theta_1 OR^U_{i,t+1} + \theta_2 OR^D_{i,t+1} + \boldsymbol{\theta_c X_{i,t+\tau-1}} + \varepsilon_{i,t} \quad (4.9a)$$

(τ = -1, 0, 2, 3)

$$\Delta leverage_{i,t+\tau} = \frac{D_{i,t+\tau}}{A_{i,t+\tau}} - \frac{D_{i,t+\tau-1}}{A_{i,t+\tau-1}} = -\left[\frac{E_{i,t+\tau}}{A_{i,t+\tau}} - \frac{E_{i,t+\tau-1}}{A_{i,t+\tau-1}}\right]$$
$$= -\frac{\Delta E_{i,t+\tau}}{A_{i,t+\tau}} - \frac{\Delta earnings_{i,t+\tau}}{A_{i,t+\tau}} - E_{i,t+\tau-1}\left[\frac{1}{A_{i,t+\tau}} - \frac{1}{A_{i,t+\tau-1}}\right] \quad (4.9b)$$

(τ = -1, 0, 2, 3)

where $\Delta E_{i,t+\tau}$ is the equity issuance of firm *i* at time $t+\tau$; $\Delta leverage_{i,t+\tau}$ is the leverage differences between the period of $t+\tau$ and $t+\tau-1$. $\Delta earnings_{i,t+\tau}$is the retained earnings differences between the period of $t+\tau$ and $t+\tau-1$. $E_{i,t+\tau-1}$ is the stockholders' equity for firm *i* at time $t+\tau-1$. The main focus, the market-to-book ratio, is included in the control variable vector $\boldsymbol{X_{i,t+\tau-1}}$ and notified as $growth_{i,t+\tau-1}$ in this study.

Panel A of Table 4.8 shows the results of regression (4.9a). The effects of market-to-book ratio on annual changes in book leverage are significant and negative in the two periods before rating change is announced. A one unit increase in market-to-book ratio is associated with around 0.014% decrease in leverage. The

effects are insignificant after DCRCs, which is discussed in much more detail after the market-to-book ratio is subjected to the three regression tests in which the leverage components have been decomposed in (4.9b).

[Insert Table 4.8 here]

The signs and significances of coefficients on control variables are in accordance with Baker and Wurgler (2002)'s results. Panel A of Table 4.8 lists the test results of equation (4.9a). *Size* and *tangibility* tend to increase leverages while *profit* tends to reduce leverage. In addition, the degrees of influences seem higher before DCRCs than those after DCRCs in all control variables. For instance, one unit increase on *profit* decreases leverage 1.08% and 1.10% in two-period and one-period before DCRCs respectively, but only 0.56% and 0.57% correspondingly after DCRCs.

The results shown in the other three panels in Table 4.8, Panel B, C and D, suggest that the market-to-book ratio affects the change in leverage through all three components throughout the periods around rating change quarters. Panel B of Table 4.8 shows that higher market-to-book ratio is associated with higher equity issue, confirming the idea that firms increase equity when the market valuation is high as that in Marsh (1982) and Baker and Wurgler (2002). Panel C and Panel D of Table 4.8 show that market-to-book ratios are negatively related to both newly retained earnings and the residual change in leverage. The effects of market-to-book ratio on retained earnings are significantly increased from 5.995% and 6.119% before DCRCs to 6.379% after DCRCs to one unit market-to-book ratio decrease. The effects of the ratio to the residual change in leverage decrease from two

quarters before DCRCs to two quarters after DCRCs, nevertheless, the effects keep negative.

Summarising the results in the four panels in Table 4.8, the market-to-book ratio effects on leverage change are only significant before DCRC but not afterwards after combining the three components, which have the trade-off effects among them.

In addition, the other major concern in this test is the DCRC's added power to the Market Timing Theory. According to the significance of coefficient estimates, DCRC has the added explanatory power to the change in leverage and net equity issuance in the tests presented in Panel A and B of Table 4.8, relatively. The signs of DCRCs is rational and consistent with what was explored earlier: financing adjustments one period before delayed upgrades derive a significant leverage drop and adjustments around delayed downgrades, associated with other factors, cause a leverage increase in the four periods around DCRC. However, as shown in Panel C and D of Table 4.8, DCRC does not show added explanatory power in these two panels. Overall, the results in the four panels of Table 4.8 support the stand of the *Market Timing Theory* when nesting DCRCs in the tests.

4.4.4 Other Existing Theories

Apart from the classic capital structure theories, *Ross (1977)'s signalling* equilibrium and the *Free Cash Flow Theory*, for instance, are also shed lights on capital structure study. Ross (1977) shows that only high quality firms can afford the risk from increasing debt levels. This traditional *Signalling Theory* does not seem to apply in this study since delayed credit rating upgrades may increase the

cost of signalling for 'good' issuers. Flannery (1996) argues that 'the existence of a signalling equilibrium is shown to depend on the (exogenous) distribution of firms' quality and the magnitude of underwriting costs for corporate debt'. Issuers may choose to signal in a more affordable way[62], for instance, signalling through quarterly earnings announcements or the presentation of financial statement, as introduced in Riedl and Srinivasan (2010).

The *Free Cash Flow Theory*, designed for mature firms which are prone to overinvest, says that dangerous high debt levels will increase value, despite the threat of financial distress, when a firm's operating cash flow significantly exceeds its profitable investment opportunities. Since it is not a theory predicting how managers will choose capital structures, but a theory about the consequences of high debt ratios (Myers (2001)), thus no efforts are made to discuss the results in this study in the context of the *Free Cash Flow Theory*.

In summary, a range of evidence and theories have shown the fact that information asymmetry driven by delayed rating change affects firms' financing strategies and tactics. The results are explained most naturally by the capital structure theories which consider the influences of information asymmetry, although other interpretations cannot be completely ruled out. In addition, the significant coefficients on rating changes show that DCRC has additional values on explaining financing adjustment when it is imbedded into the tests examining existing capital structure theories.

[62] Firms provide disclosure through regulated financial reports. Some firms engage in voluntary communication: management forecasts, analysts' presentations and conference calls, press releases, internet sites, and other corporate reports. In addition, there are disclosures about firms by information intermediaries, such as financial analysts, industry experts and the financial press. (Healy and Palepu (2001)).

4.5 Discussions and Conclusions

This chapter examines the robustness of the influences of delayed credit rating changes (DCRCs) on financing adjustments in the North American market from Q1 1985 to Q4 2010. By performing a number of robust regressions, the study shows strong evidence that the DCRCs' effect is significant and robust to influence issuers' financing policies.

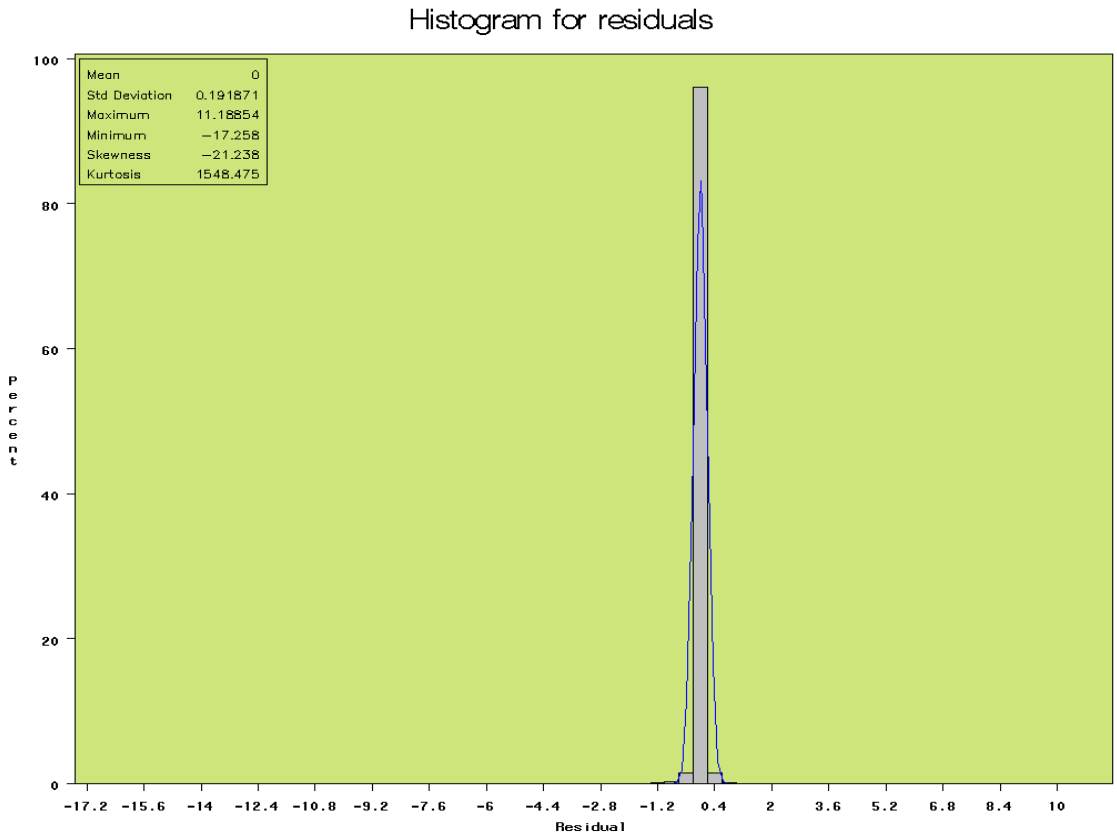
In addition, DCRC assumption is incorporated into the traditional capital structure theories and evidence derived from tests suggest that DCRC assumption has added explanatory power to the existing theories on issuers' financing adjustments. However, not all the phenomena found under DCRC assumption can be explained by the existing theories. Since the DCRC assumption test is fundamentally based on the condition of information asymmetry, it fits better with the *Pecking Order Theory* and the *Market Timing Theory*. However, it is incompatible with the *Trade-off Theory* since the latter retains the assumptions of market efficiency and symmetric information though it adds various imperfections such as taxes, financial distress and agency costs (Baker and Wugeler (2002)). This study believes that the most realistic and plausible explanation for the financing adjustments before rating change announcements is the effects of DCRCs, which create an information gap window between issuers and outsiders.

In summary, a range of evidence and theories have shown the fact that the effect of information asymmetry from delayed rating changes influences firms' financing strategy and tactics. There is little doubt that the results are most plausibly explained by the theories which consider the influence of information

asymmetry[63], although other interpretations cannot be completely ruled out. While shedding light on how DCRC, the factor driven information asymmetry, affects issuers' financing, the study in this chapter also raises new questions: Do financing adjustment bring material outcomes to issuers? Do issuers gain benefits through issuing debt or equity before DCRC announced by rating agencies? Which measures of firm performance would managers aim to improve? To what extent would the firm performance be improved? Efforts on answering these questions are made in the next chapter.

[63] The Pecking Order Theory has been considered the theory for explaining firms' financing behaviours under asymmetric information conditions in recent studies, for example, Leary and Roberts (2010), have partially broken it by stating that pecking order is due to incentive conflicts rather than to information asymmetry.

Figure 4.1 Histogram for standardised residuals of the regression.



The full data sample has a 0.3077 Kolmogorov-Smirnov *D statistic,* a 3665.89 Cramér-von Mises W^2 *statistic* and a 18332.265 Anderson-Darling A^2 *statistic.*

Table 4. 1 Summary statistics

The sample is drawn from quarterly Compustat data, excluding financial firms and utility firms and firm-quarters with negative equity values during the period Q1 1985 - Q4 2010. It lists summary statistics of dependant variables and control variables in the tests. Δdet is defined as long-term debt issuance minus long-term debt reduction plus changes in current debt and normalised by firms' total assets. Δeqt is defined as sale of common and preferred stock minus purchases of common and preferred stock and normalized by firms' total assets. Δnet is the defined as Δdet minus Δeqt. Other control variable definitions are *Leverage*: ratio of the sum of short-term debt (*Sd*) and long-term debt (*Ld*) to the sum of short-term debt, long-term debt, and stockholders' equity. *Size:* logarithm of sales. *Price***:** logarithm of the close price of the quarter. *Liquidity*: ratio of cash and cash equivalent divided (normalised) by total assets. *Profit***:** ratio of *EBITDA* to total assets. *Dividends*: ratio of dividends to total assets. *Earnings***:** ratio of retained earnings to total assets. *Growth***:** total debt book value plus quarterly close price multiplied by outstanding common stock shares and normalised by total assets. *Tangibility*: ratio of property plant and equipment (Net) to total assets. *NDTS*: ratio of deferred taxes and investment tax credit to total assets. *DEF*: the book value of long-term debt. $\Delta leverage$: the gap of leverage between two continuous periods. $\Delta earnings$: the gap of earnings between two continuous periods.

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	125,805	0.006	0.000	0.086	-1.414	11.164
Δeqt	229,674	0.014	0.000	0.161	-1.795	17.584
Δnet	114,970	-0.010	-0.002	0.200	-17.584	11.164
$\Delta Sdet$	134,263	0.002	0.000	0.049	-1.414	3.885
$\Delta Ldet$	230,587	0.005	0.000	0.088	-3.876	11.164
Leverage	114,970	0.226	0.160	0.240	0.000	1.000
Size	114,970	3.280	3.266	2.520	-6.908	11.730
Price	114,970	1.953	2.183	1.529	-7.419	11.523
Liquidity	114,970	0.197	0.102	0.225	-0.034	1.000
Profit	114,970	0.007	0.024	0.224	-59.926	13.207
Dividends	114,970	0.007	0.000	0.037	-0.012	3.700
Earnings	114,970	-0.653	0.141	9.344	-2624.430	2.337
Growth	114,970	1.957	1.167	8.760	0.001	2370.330
Tangibility	114,970	0.258	0.191	0.227	0.000	1.000
NDTS	114,970	0.018	0.000	0.033	-0.013	0.692
DEF	282,199	-1.988	0.021	304.833	-23648.000	30093.000
$\Delta leverage$	466,186	0.003	0.000	0.071	-0.984	0.995
$\Delta earnings$	443,447	0.090	0.001	47.490	-0.000	0.000

Table 4. 2 Coefficient estimates of logit tests

Values of estimated coefficients and their *Wald Chi-square* for nonfinancial firms with Logistic regression (4.2a) and (4.2b). Estimated parameters on rating indicators describe influences of delayed rating changes on price changes in the period of rating changes and in the periods after rating changes. The numbers in brackets underneath coefficient estimates are *Wald Chi-square*. Rating changes take places at quarter *t+1*. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Before rating changes				**After rating changes**			
	Panel A Two quarters before rating changes (τ = -1)		**Panel B One quarter before rating changes (τ = 0)**		**Panel C One quarter after rating changes (τ = 2)**		**Panel D Two quarters after rating changes (τ = 3)**	
	Debt issue	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**
Intercept	-1.4035***	-0.6641***	-1.3460***	-0.6621***	-1.2847***	-0.6915***	-1.2896***	-0.6906***
	(5480.5706)	(2273.3363)	(5286.6437)	(2344.9561)	(4851.4489)	(2545.0094)	(4894.2937)	(2542.0328)
OR^U	-0.2797***	0.1519***	-0.1537**	0.1558***	-0.1116*	-0.0137	-0.0582	-0.0211
	(19.3752)	(12.1659)	(6.2864)	(12.7347)	(3.3217)	(0.0955)	(1.3815)	(0.3529)
OR^D	0.0529	-0.0469	0.1150**	-0.0504	0.1495***	0.0209	-0.0865*	0.0562
	(1.2742)	(1.5968)	(6.6124)	(1.9478)	(11.2958)	(0.3364)	(3.4282)	(2.5779)
Leverage	-0.0166	-0.3123***	-0.0467*	-0.3335***	-0.0614**	-0.3625***	-0.0528*	-0.3641***
	(0.3333)	(234.1056)	(2.7706)	(278.6723)	(4.8503)	(331.9073)	(3.588)	(334.3741)
Size	0.0168***	-0.0359***	0.0139***	-0.0401***	0.0111***	-0.0385***	0.0126***	-0.0387***
	(17.4622)	(159.8839)	(12.3891)	(207.3085)	(7.8969)	(190.4312)	(10.2828)	(192.8655)
Price	0.0432***	0.2763***	0.0386***	0.2885***	0.0310***	0.3006***	0.0303***	0.3007***
	(47.4451)	(3427.7071)	(40.2915)	(3914.3778)	(26.7521)	(4256.5229)	(25.6129)	(4259.1741)
Liquidity	-3.8141***	0.0657**	-4.0501***	0.0816***	-4.3749***	0.0581**	-4.3703***	0.0573**
	(4821.7517)	(6.6142)	(5390.0359)	(10.6101)	(5843.6028)	(5.33)	(5832.0121)	(5.1832)
Profit	-0.4141***	-0.1676***	-0.4449***	-0.1773***	-0.2365***	-0.0371	-0.2437***	-0.0366
	(54.5697)	(15.0447)	(67.3663)	(18.0926)	(15.4663)	(1.1967)	(16.5048)	(1.1844)
Dividends	1.0266***	-1.4675***	0.3559	-1.7011***	1.1209***	-10.3437***	1.1269***	-10.3424***
	(17.3431)	(29.5745)	(1.3638)	(36.2337)	(19.4432)	(293.408)	(19.7145)	(293.4394)
Earnings	-0.0019***	-0.0043***	-0.0019***	-0.0047***	-0.0014*	-0.0065***	-0.0015*	-0.0065***
	(6.4288)	(7.2321)	(7.1373)	(9.9195)	(3.2358)	(19.4838)	(3.3136)	(19.4476)
Growth	0.0007	0.0377***	0.0006	0.0389***	0.0008	0.0551***	0.0008	0.0551***
	(0.8006)	(329.0521)	(0.6938)	(357.017)	(0.9147)	(600.5926)	(0.9321)	(600.5698)
Tangibility	-0.2277***	-0.0548***	-0.2274***	-0.0512**	-0.2520***	-0.0442**	-0.2501***	-0.0445**
	(64.9647)	(6.6831)	(68.2168)	(6.0725)	(85.0994)	(4.5595)	(83.8784)	(4.6092)
NDTS	-0.4088**	-2.2424***	-0.4316**	-2.2012***	-0.5027***	-2.0301***	-0.4930***	-2.0315***
	(4.6106)	(248.2016)	(5.3437)	(247.693)	(7.2787)	(211.3133)	(7.0019)	(211.6076)
Max-rescaled R-Square	0.0681	0.0438	0.0726	0.0479	0.0783	0.0562	0.0782	0.0562
N	244,970	244,970	253,612	253,612	255,635	255,635	255,635	255,635

Table 4.2 *(continued)* **Odds ratio estimates of logit tests**

	Before rating changes				After rating changes			
	Panel A Two quarters before rating changes (τ = -1)		Panel B One quarter before rating changes (τ = 0)		Panel C One quarter after rating changes (τ = 2)		Panel D Two quarters after rating changes (τ = 3)	
	Debt issue	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**
Intercept	0.2457***	0.5147***	0.2603***	0.5158***	0.2767***	0.5008***	0.2754***	0.5013***
OR^U	0.7560***	1.1640***	0.8575**	1.1686***	0.8944*	0.9864	0.9435	0.9791
OR^D	1.0543	0.9542	1.1219**	0.9508	1.1613***	1.0211	0.9171*	1.0578
Leverage	0.9835	0.7318***	0.9544*	0.7164***	0.9404**	0.6959***	0.9486*	0.6948***
Size	1.0169***	0.9647***	1.0140***	0.9607***	1.0112***	0.9622***	1.0127***	0.9620***
Price	1.0441***	1.3182***	1.0394***	1.3344***	1.0315***	1.3507***	1.0308***	1.3508***
Liquidity	0.0221***	1.0679**	0.0174***	1.0850***	0.0126***	1.0598**	0.0126***	1.0590**
Profit	0.6609***	0.8457***	0.6409***	0.8375***	0.7894***	0.9636	0.7837***	0.9641
Dividends	2.7916***	0.2305***	1.4275	0.1825***	3.0676***	0.0000***	3.0861***	0.0000***
Earnings	0.9982***	0.9957***	0.9981***	0.9953***	0.9986*	0.9935***	0.9986*	0.9935***
Growth	1.0007	1.0384***	1.0006	1.0397***	1.0008	1.0566***	1.0008	1.0566***
Tangibility	0.7964***	0.9467***	0.7966***	0.9501**	0.7772***	0.9568**	0.7787***	0.9565***
NDTS	0.6644**	0.1062***	0.6495**	0.1107***	0.6049***	0.1313***	0.6108***	0.1311***

Marginal effects of upgrades and downgrades

	Before rating changes				After rating changes			
	Panel A Two quarters before rating changes (τ = -1)		Panel B One quarter before rating changes (τ = 0)		Panel C One quarter after rating changes (τ = 2)		Panel D Two quarters after rating changes (τ = 3)	
	Debt issue	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**	**Debt issue**	**Equity issue**
OR^U	0.0002	0.0003	-0.0151	0.0385	0.0003	0.0004	0.0003	0.0003
OR^D	0.0001	0.0001	0.0125	-0.0123	0.0001	0.0001	0.0001	0.0001

Table 4. 3 Remedy of high kurtosis of residuals ---- Excluding outliers outside of 3SD

Values of estimated coefficients and their *t-statistic* for nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on price changes in the period of rating changes and in the periods after rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take places at quarter *t+1*. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.0022***	0.0096***	0.0118***	0.0039***	0.0092***	0.0054***	0.0008	0.0088***	0.0080***	0.0006	0.0087***	0.0080***
	(-2.37)	(15.99)	(16.92)	(5.70)	(18.95)	(11.74)	(1.27)	(18.36)	(18.90)	(0.95)	(17.98)	(18.94)
OR^U	-0.0039	-0.0012	0.0027	-0.0030	0.0002	0.0032*	0.0055**	0.0059***	0.0004	-0.0040**	0.0008	0.0048***
	(-1.08)	(-0.5)	(1.01)	(-1.14)	(0.09)	(1.79)	(2.12)	(3.05)	(0.24)	(-2.03)	(0.54)	(3.71)
OR^D	0.0045	0.0069***	0.0024	0.0083***	0.0085***	0.0002	0.0070***	0.0103***	0.0033***	0.0006	0.0038***	0.0032***
	(1.56)	(3.70)	(1.10)	(4.01)	(5.71)	(0.15)	(3.58)	(7.05)	(2.55)	(0.30)	(2.65)	(2.55)
Leverage	-0.0267***	-0.0187***	0.0080***	-0.0171***	-0.0168***	0.0003	-0.0215***	-0.0168***	0.0047***	-0.0211***	-0.0165***	0.0046***
	(-17.94)	(-19.51)	(7.21)	(-15.88)	(-21.7)	(0.37)	(-21.00)	(-21.99)	(7.06)	(-20.53)	(-21.59)	(6.80)
Size	0.0042***	-0.0009***	-0.0051***	0.0011***	-0.0010***	-0.0021***	0.0023***	-0.0008***	-0.0031***	0.0023***	-0.0008***	-0.0031***
	(21.97)	(-7.59)	(-35.90)	(8.23)	(-9.79)	(-22.59)	(16.83)	(-8.51)	(-35.31)	(17.17)	(-8.08)	(-35.30)
Price	-0.0015***	0.0023***	0.0038***	0.0002	0.0019***	0.0018***	0.0006***	0.0018***	0.0012***	0.0006***	0.0018***	0.0012***
	(-5.01)	(11.78)	(16.83)	(0.77)	(12.24)	(11.89)	(2.78)	(11.33)	(8.63)	(2.90)	(11.36)	(8.47)
Liquidity	-0.0090***	-0.0206***	-0.0117***	-0.0037***	-0.0199***	-0.0162***	-0.0085***	-0.0204***	-0.0120***	-0.0083***	-0.0203***	-0.0120***
	(-5.21)	(-18.63)	(-9.06)	(-2.97)	(-21.99)	(-19.02)	(-7.04)	(-22.82)	(-15.17)	(-6.90)	(-22.65)	(-15.16)
Profit	0.0715***	-0.0174***	-0.0889***	0.1552***	-0.0030***	-0.1582***	0.0239***	-0.0152***	-0.0391***	0.0240***	-0.0154***	-0.0393***
	(22.52)	(-8.52)	(-37.44)	(112.00)	(-3.02)	(-168.76)	(11.90)	(-10.16)	(-29.67)	(11.92)	(-10.27)	(-29.79)
Dividends	0.0081	0.0009	-0.0073	-0.0011	0.0004	0.0015	0.0273***	0.0060	-0.0213***	0.0271***	0.0058	-0.0213***
	(1.32)	(0.22)	(-1.58)	(-0.23)	(0.13)	(0.48)	(3.24)	(0.95)	(-3.87)	(3.22)	(0.92)	(-3.86)
Earnings	0.0017***	-0.0002***	-0.0019***	0.0002***	-0.0004***	-0.0006***	0.0006***	-0.0003***	-0.0009***	0.0006***	-0.0003***	-0.0009***
	(16.31)	(-2.90)	(-24.30)	(2.46)	(-8.07)	(-12.22)	(8.50)	(-6.17)	(-19.96)	(8.38)	(-6.26)	(-19.86)
Growth	-0.0025***	0.0001***	0.0026***	-0.0030***	-0.0001*	0.0029***	-0.0022***	0.0002***	0.0023***	-0.0022***	0.0001***	0.0023***
	(-28.97)	(2.40)	(40.80)	(-43.36)	(-1.95)	(62.01)	(-28.30)	(2.66)	(46.15)	(-28.42)	(2.65)	(46.29)
Tangibility	-0.0044***	0.0065***	0.0109***	-0.0038***	0.0062***	0.0101***	-0.0017	0.0064***	0.0080***	-0.0016	0.0065***	0.0080***
	(-2.80)	(6.42)	(9.26)	(-3.34)	(7.51)	(12.94)	(-1.53)	(7.81)	(11.19)	(-1.43)	(7.93)	(11.17)
NDTS	0.0303***	-0.0154***	-0.0457***	0.0033	-0.01319***	-0.0165***	0.0061	-0.0132***	-0.0193***	0.0064	-0.0129***	-0.0193***
	(2.93)	(-2.31)	(-5.91)	(0.44)	(-2.42)	(-3.23)	(0.85)	(-2.45)	(-4.08)	(0.89)	(-2.40)	(-4.07)
Adj R-square	0.0433	0.0076	0.0818	0.2410	0.0091	0.4178	0.0294	0.0100	0.0754	0.0294	0.0096	0.0756
N	110,215	110,215	110,215	113,835	113,835	113,835	114,635	114,635	114,635	114,638	114,638	114,638
Residual Skewness	-1.7598			-1.0122			-0.5616			-0.5674		
Residual Kurtosis	33.4134			21.2608			15.7990			15.7990		
Kolmogorov-Smirnov	0.1987			0.2044			0.1637			0.1640		
Cramer-von Mises	1662.19			1848.63			1270.52			1267.72		
Anderson-Darling	8984.29			9506.62			6880.47			6868.59		

Table 4. 4 Remedy of high kurtosis of residuals ---- MM estimation

Values of estimated coefficients and their *chi-statistic* for nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on financing adjustments before and after the periods of rating changes. The numbers in brackets underneath coefficient estimates are *chi-statistic.* Rating changes take places at quarter *t+1*. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes (τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.0008***	-0.0009***	0.0001***	-0.0007***	-0.0008***	0.0001***	-0.0007***	-0.0007***	0.0000***	-0.0008***	-0.0007***	0.0000***
	(13.63)	(50.44)	(15.16)	(11.18)	(42.96)	(13.08)	(11.32)	(32.51)	(7.42)	(14.54)	(36.28)	(9.86)
OR^U	-0.0024***	-0.0012***	0.0001***	-0.0016*	-0.0003	0.0000	0.0016*	0.0007	0.0000	0.0002	0.0004	0.0000
	(8.23)	(6.06)	(9.26)	(3.67)	(0.45)	(0.54)	(3.45)	(1.95)	(0.49)	(0.15)	(1.23)	(0.58)
OR^D	0.0023***	0.0015***	-0.0001	0.0021***	0.0024***	-0.0001	-0.0003	0.0011***	0.0000	-0.0027***	-0.0016***	0.0000
	(10.99)	(13.21)	(3.37)	(10.30)	(36.34)	(1.90)	(0.19)	(7.34)	(0.19)	(18.86)	(18.03)	(0.12)
Leverage	-0.0084***	-0.0047***	-0.0004***	-0.0082***	-0.0047***	-0.0004***	-0.0077***	-0.0044***	-0.0003***	-0.0076***	-0.0043***	-0.0003***
	(553.25)	(487.39)	(258.76)	(558.69)	(523.74)	(274.50)	(515.92)	(485.63)	(267.11)	(497.77)	(453.91)	(264.64)
Size	0.0006***	0.0000	0.0000***	0.0006***	0.0000	0.0000***	0.0006***	0.0000	0.0000***	0.0006***	0.0000	0.0000**
	(173.37)	(0.00)	(23.76)	(181.38)	(0.14)	(14.51)	(171.66)	(1.68)	(5.74)	(180.11)	(0.71)	(5.12)
Price	0.0004***	0.0003***	0.0001***	0.0003***	0.0003***	0.0001***	0.0002***	0.0002***	0.0001***	0.0003***	0.0002***	0.0001***
	(25.54)	(47.36)	(862.54)	(17.41)	(44.92)	(912.71)	(13.72)	(36.46)	(840.69)	(16.29)	(34.83)	(739.75)
Liquidity	-0.0022***	-0.0003	0.0006***	-0.0022***	-0.0004	0.0006***	-0.0021***	-0.0003	0.0006***	-0.0022***	-0.0003	0.0006***
	(28.76)	(1.64)	(434.28)	(31.64)	(2.78)	(481.88)	(30.55)	(1.92)	(493.77)	(30.77)	(1.44)	(518.83)
Profit	-0.0016***	-0.0015***	0.0004***	-0.0017***	-0.0013***	0.0004***	-0.0016***	-0.0002	0.0004***	-0.0014**	-0.0002	0.0004***
	(6.76)	(22.88)	(60.43)	(8.76)	(19.88)	(67.52)	(7.22)	(2.47)	(84.99)	(5.38)	(2.59)	(58.00)
Dividends	0.0025	0.0012	-0.0022***	0.0026*	0.0012	-0.0022***	0.0051*	0.0002	-0.0035***	0.0050*	0.0002	-0.0036***
	(3.37)	(2.42)	(121.84)	(3.68)	(2.44)	(126.14)	(3.72)	(0.02)	(186.86)	(3.51)	(0.02)	(192.87)
Earnings	-0.0001***	0.0000	0.0000***	0.0000*	0.0000	0.0000***	0.0000	0.0000	0.0000***	-0.0001**	0.0000	0.0000***
	(8.57)	(1.86)	(34.28)	(4.50)	(1.80)	(42.86)	(3.07)	(0.89)	(48.97)	(5.57)	(0.93)	(68.63)
Growth	-0.0006***	0.0000	0.0003***	-0.0005***	0.0000	0.0003***	-0.0005***	0.0000	0.0003***	-0.0005***	0.0000	0.0003***
	(338.40)	(0.00)	(7694.68)	(304.85)	(0.02)	(8001.57)	(276.84)	(0.00)	(8654.44)	(281.29)	(0.01)	(8638.76)
Tangibility	0.0038***	0.0027***	-0.0003***	0.0037***	0.0027***	-0.0003***	0.0037***	0.0025***	-0.0002***	0.0037***	0.0025***	-0.0003***
	(101.61)	(145.85)	(133.64)	(104.38)	(149.54)	(136.67)	(104.00)	(137.52)	(135.47)	(106.34)	(139.50)	(138.3)
NDTS	-0.0031	-0.0027*	-0.0031***	-0.0032	-0.0027*	-0.0030***	-0.0037	-0.0028***	-0.0029***	-0.0037	-0.0027*	-0.0029***
	(1.65)	(3.61)	(424.66)	(1.87)	(3.91)	(432.64)	(2.61)	(4.20)	(423.3)	(2.59)	(3.78)	(415.26)
R-square	0.0048	0.0018	0.0129	0.0046	0.0018	0.0128	0.0043	0.0016	0.0131	0.0043	0.0016	0.0131
N	110,657	121,123	221,313	114,970	125,805	229,674	115,779	126,693	231,339	115,779	126,693	231,339
Outliers %	0.0943	0.1045	0.1494	0.0941	0.1047	0.1500	0.0941	0.1051	0.1500	0.0941	0.1051	0.1501
Deviance	95.2118	47.8614	3.2330	98.0904	49.2180	3.2205	96.8085	49.0163	3.1304	96.8327	48.9645	3.1215

Table 4. 5 Random time and industry effects tested by mixed linear models

Values of estimated coefficients and their *t-statistic* for nonfinancial firms. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take places at quarter *t+1*. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. The four panels show the financing adjustments during the four periods from two periods before rating changes to two periods after rating changes.

	Before rating changes						**After rating changes**					
	Panel A **Two quarters before rating changes** **(τ = -1)**			**Panel B** **One quarter before rating changes** **(τ = 0)**			**Panel C** **One quarter after rating changes** **(τ = 2)**			**Panel D** **Two quarters after rating changes** **(τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.0169***	0.0099***	0.0228***	-0.0105***	0.0115***	0.0193***	-0.0072***	0.0120***	0.0175***	-0.0074***	0.0118***	0.0175***
	(-4.54)	(7.58)	(10.91)	(-4.86)	(12.46)	(13.73)	(-3.59)	(12.98)	(13.60)	(-3.69)	(12.81)	(13.59)
OR^U	-0.0094	-0.0014	0.0071	-0.0036	0.0044	0.0094***	0.0014	0.0077***	0.0045	-0.0234***	0.0043*	0.0142***
	(-0.72)	(-0.30)	(1.25)	(-0.52)	(1.47)	(2.68)	(0.21)	(2.53)	(1.37)	(-4.58)	(1.83)	(5.41)
OR^D	-0.0093	0.0076*	0.0099**	0.0091*	0.0181***	0.0062**	0.0086*	0.0187***	0.0073***	-0.0015	0.0092***	0.0062***
	(-0.89)	(1.96)	(2.06)	(1.67)	(7.72)	(2.14)	(1.69)	(8.00)	(2.75)	(-0.31)	(4.03)	(2.43)
Leverage	-0.0452***	-0.0145***	0.0259***	-0.0300***	-0.0172***	0.0159***	-0.0335***	-0.0166***	0.0159***	-0.0327***	-0.0162***	0.0157***
	(-8.29)	(-7.28)	(9.73)	(-10.36)	(-14.05)	(9.85)	(-12.44)	(-13.59)	(10.84)	(-12.13)	(-13.32)	(10.70)
Size	0.0112***	-0.0013***	-0.0116	0.0092***	-0.0015***	-0.0103***	0.0089***	-0.0016***	-0.0100***	0.0090***	-0.0015***	-0.0100***
	(15.63)	(-5.13)	(-30.37)	(23.62)	(-9.26)	(-44.04)	(24.46)	(-9.81)	(-46.6)	(24.77)	(-9.43)	(-46.73)
Price	-0.0073***	0.0024***	0.0088***	-0.0078***	0.0022***	0.0090***	-0.0062***	0.0020***	0.0080***	-0.0062***	0.0020***	0.0080***
	(-6.76)	(5.93)	(15.52)	(-13.38)	(8.88)	(26.46)	(-11.54)	(8.30)	(25.86)	(-11.56)	(8.23)	(25.83)
Liquidity	-0.0194***	-0.0202***	0.0052	-0.0083***	-0.0184***	-0.0038*	-0.0140***	-0.0187***	-0.0027	-0.0136***	-0.0185***	-0.0028
	(-3.00)	(-8.94)	(1.46)	(-2.40)	(-12.95)	(-1.76)	(-4.32)	(-13.07)	(-1.34)	(-4.18)	(-12.95)	(-1.40)
Profit	0.2098***	-0.0003	-0.1747***	0.1935***	-0.0029***	-0.1615***	0.0651***	-0.0019***	-0.0710***	0.0651***	-0.0020***	-0.0710***
	(42.00)	(-0.14)	(-54.59)	(72.70)	(-2.48)	(-83.29)	(41.99)	(-2.62)	(-60.12)	(41.98)	(-2.65)	(-60.13)
Dividends	0.0028	0.0005	-0.0005	0.0015	0.0003	-0.0003	0.0397*	-0.0002	-0.0212	0.0392*	-0.0004	-0.0211
	(0.13)	(0.06)	(-0.03)	(0.13)	(0.06)	(-0.03)	(1.83)	(-0.02)	(-1.47)	(1.80)	(-0.04)	(-1.46)
Earnings	0.0011***	-0.0001	-0.0015***	0.0009***	-0.0001***	-0.0012***	0.0011***	-0.0002***	-0.0015***	0.0011***	-0.0002***	-0.0015***
	(9.68)	(-1.53)	(-18.37)	(13.72)	(-4.67)	(-25.07)	(17.19)	(-5.44)	(-31.1)	(17.16)	(-5.48)	(-31.09)
Growth	-0.0018***	0.0001	0.0029***	-0.0018***	0.0001***	0.0028***	-0.0025***	0.0001***	0.0033***	-0.0025***	0.0001***	0.0033***
	(-14.01)	(1.18)	(32.76)	(-25.79)	(2.31)	(53.21)	(-38.97)	(4.03)	(67.40)	(-38.95)	(4.04)	(67.39)
Tangibility	-0.0063	0.0057***	0.0086***	-0.0061*	0.0070***	0.0091***	-0.0078***	0.0061***	0.0096***	-0.0078***	0.0062***	0.0096***
	(-0.94)	(2.70)	(2.59)	(-1.70)	(4.93)	(4.42)	(-2.31)	(4.28)	(5.02)	(-2.30)	(4.32)	(5.04)
NDTS	0.0515	-0.0095	-0.0251	0.0327	-0.0249***	-0.0300***	0.0482***	-0.0216***	-0.0407***	0.0486***	-0.0213***	-0.0406***
	(1.35)	(-0.68)	(-1.37)	(1.60)	(-2.87)	(-2.69)	(2.52)	(-2.49)	(-3.97)	(2.54)	(-2.45)	(-3.96)
N	110,657	121,123	221,313	114,970	125,805	229,674	115,779	126,693	231,399	115,779	126,693	231,399
Var of Time	0.000130	0.000021	0.000062	0.000105	0.000025	0.000052	0.000075	0.000026	0.000040	0.000077	0.000025	0.000041
Var of Industry	0.000124	0.000000	0.000076	0.000050	0.000002	0.000044	0.000051	0.000002	0.000044	0.000050	0.000003	0.000043
Var of Residuals	0.1254	0.01889	0.06232	0.03665	0.007318	0.02362	0.03226	0.007364	0.01995	0.03226	0.007367	0.01995

Table 4. 6 Tests of the Trade-off Theory nested with delayed credit rating changes

Values of estimated coefficients and their *t-statistic* for nonfinancial firms from the regression below.

$$\Delta Ldet_{i,t+\tau} = a + d_1 OR^{U}_{i,t+1} + d_2 OR^{D}_{i,t+1} + b\frac{(TLD_i - LD_{i,t+\tau-1})}{A_{i,t+\tau-2}} + \varepsilon_{i,t+\tau} \quad (4.7)$$

(τ =-1, 0, 2, 3)

Estimated parameters on rating indicators describe influences of delayed rating changes on price changes in the period of rating changes and in the periods after rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take places at quarter *t+1*. 0<b<1 if the *Trade-off Theory* stands. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Panel A		**Panel B**			
	Nesting DCRCs when τ = 0		**Trade-off effects around DCRCs**			
	Without rating change indicators	**With rating change indicators**	**τ = -1**	**τ = 0**	**τ = 2**	**τ = 3**
Intercept	0.0055***	0.0050***	0.1253	0.0050***	0.0049**	0.0051***
(a)	(6.94)	(6.27)	(0.81)	(6.27)	(6.41)	(6.57)
$OR^{U}_{i,t+1}$		-0.0013	-0.0519	-0.0013	0.0024	0.0008
		(-0.16)	(-0.03)	(-0.16)	(0.30)	(0.12)
$OR^{D}_{i,t+1}$		0.0343***	0.1584	0.0343***	0.0159**	0.0059
		(5.12)	(0.12)	(5.12)	(2.46)	(0.96)
$TLD_i - LD_{i,t+\tau-1}$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
(b)	(0.39)	(0.39)	(0.01)	(0.39)	(-0.77)	(-0.77)
Adj R-square	0.0000	0.0001	0.0000	0.0001	0.0000	0.0000
N	282,364	282,364	279,888	282,364	282,314	282,314

Table 4. 7 Tests of the Pecking Order Theory nested with delayed credit rating changes

Values of estimated coefficients and their *t-statistic* for nonfinancial firms from the regressions below:

$$\Delta Ldet_{i,t} = a + b\frac{DEF_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (4.8a)$$

$$\Delta Ldet_{i,t+\tau} = a + g_1 OR^{U}_{i,t+1} + g_2 OR^{D}_{i,t+1} + b\frac{DEF_{i,t+\tau}}{A_{i,t+\tau-1}} + \varepsilon_{i,t} \quad (4.8b)$$

$(\tau = -1, 0, 2, 3)$

Estimated parameters on rating indicators describe influences of delayed rating changes on price changes in the period of rating changes and in the periods after rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take places at quarter *t+1*. a=0 and b=1 if the *pecking order theory* stands. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Panel A Pecking order effects		**Panel B Pecking order time effects around DCRCs**			
	Without rating change indicators (equation 4.8a)	**With rating change indicators (equation 4.8b)**	τ **= -1**	τ **= 0**	τ **= 2**	τ **= 3**
Intercept	0.0051***	0.0047***	0.0050**	0.0047***	0.0053***	0.0055***
(a)	(6.50)	(5.88)	(6.04)	(5.88)	(14.72)	(15.29)
$OR^{U}_{i,t+1}$		-0.0037	-0.0005	-0.0037	0.0008	-0.0006
		(-0.46)	(-0.06)	(-0.46)	(0.23)	(-0.15)
$OR^{D}_{i,t+1}$		0.0340***	0.0059	0.0340***	0.0162***	0.0018
		(5.04)	(0.85)	(5.04)	(5.23)	(0.58)
$DEF_{i,t+\tau}$	0.0034***	0.0034***	0.0050**	0.0034***	0.0002***	0.0002***
(b)	(14.80)	(14.81)	(17.51)	(14.81)	(2.33)	(2.33)
Adj R-square	0.0008	0.0001	0.0011	0.0001	0.0001	0.0000
N	282,199	282,199	281,261	282,199	281,950	281,950

Table 4. 8 Tests of the Market Timing Theory nested with delayed credit rating changes

Values of estimated coefficients and their *t-statistic* for nonfinancial firms. Estimated parameters on rating indicators describe influences of delayed rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take places at quarter $t+1$. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

	Panel A **Change in book leverage** $leverage_{i,t+\tau} - leverage_{i,t+\tau-1}$				**Pane B** **Change in book leverage due to net equity issue** $-\frac{\Delta E_{i,t+\tau}}{A_{i,t+\tau}}$			
	Before Rating Changes		**After Rating Changes**		**Before Rating Changes**		**After Rating Changes**	
	τ = -1	**τ = 0**	**τ = 2**	**τ = 3**	**τ = -1**	**τ = 0**	**τ = 2**	**τ = 3**
Intercept	0.01789***	0.01732***	0.01895***	0.01875***	-0.01476***	-0.01512***	-0.0149***	-0.01493***
	(36.45)	(37.24)	(40.06)	(39.61)	(-35.00)	(-36.42)	(-36.77)	(-36.84)
OR^U	0.00062	-0.00489***	0.00254	0.00145	-0.00346***	-0.0053***	-0.00198	-0.00386***
	(0.38)	(-3.14)	(1.59)	(0.93)	(-2.46)	(-3.80)	(-1.43)	(-2.85)
OR^D	0.01566***	0.02236***	0.01996***	0.01039***	-0.00336***	-0.00391***	-0.00407***	-0.00435***
	(11.44)	(17.22)	(15.40)	(7.80)	(-2.83)	(-3.36)	(-3.66)	(-3.80)
Growth	-0.00013***	-0.00014***	-0.00002	-0.00002	-0.00065***	-0.00069***	-0.00089***	-0.00089***
	(-5.11)	(-5.48)	(-0.60)	(-0.59)	(-29.85)	(-31.64)	(-41.97)	(-41.96)
Leverage	-0.06111***	-0.05304***	-0.04454***	-0.04415***	-0.01136***	-0.01114***	-0.01194***	-0.01189***
	(-82.51)	(-75.77)	(-62.90)	(-62.32)	(-17.81)	(-17.80)	(-19.64)	(-19.54)
Size	0.00093***	0.00083***	0.00049***	0.00055***	0.00565***	0.00577***	0.00596***	0.00596***
	(9.25)	(8.78)	(5.09)	(5.71)	(65.09)	(67.48)	(71.37)	(71.45)
Price	-0.00115***	-0.0017***	-0.00251***	-0.00253***	-0.00322***	-0.00332***	-0.00326***	-0.00327***
	(-7.44)	(-11.7)	(-17.14)	(-17.26)	(-24.35)	(-25.69)	(-26.08)	(-26.08)
Liquidity	-0.02212***	-0.01993***	-0.01797***	-0.01778***	-0.00185***	-0.00142	-0.00236***	-0.00233***
	(-23.93)	(-22.66)	(-20.00)	(-19.79)	(-2.27)	(-1.76)	(-2.99)	(-2.95)
Profit	-0.0108***	-0.01109***	-0.0056***	-0.00566***	0.0248***	0.02901	0.01064***	0.01064***
	(-11.53)	(-12.06)	(-9.18)	(-9.27)	(31.46)	(36.07)	(21.17)	(21.16)
Dividends	0.00369	0.01167*	0.01003	0.00995	0.00371	0.02374***	0.0276***	0.02767***
	(0.99)	(1.85)	(1.57)	(1.56)	(1.15)	(3.74)	(4.49)	(4.50)
Earnings	-0.00006	-0.00003	-0.00014***	-0.00014***	0.00057***	0.00058***	0.00064***	0.00064***
	(-0.23)	(-1.51)	(-5.78)	(-5.81)	(27.06)	(28.20)	(32.01)	(32.00)
Tangibility	0.00982***	0.00917***	0.00713***	0.00722***	-0.00479***	-0.00489***	-0.00525***	-0.00524***
	(12.75)	(12.59)	(9.65)	(9.76)	(-7.28)	(-7.56)	(-8.34)	(-8.33)
NDTS	0.00729	0.00288	-0.0004	0.000157	0.02876***	0.02766***	0.02705***	0.02704***
	(1.42)	(0.59)	(-0.08)	(0.03)	(6.56)	(6.40)	(6.40)	(6.40)
Adj R-square	0.0279	0.0243	0.0180	0.0374	0.0279	0.0569	0.0585	0.0585
N	244,971	246,724	247,686	247,686	244,971	222,926	224,217	224,217

Table 4.8 *(continued)*

	Panel C **Change in book leverage due to newly retained earnings** $-\frac{\Delta earnings_{i,t+\tau}}{A_{i,t+\tau}}$				**Pane D** **Change in book leverage due to growth in assets** $-E_{i,t+\tau-1}\left[\frac{1}{A_{i,t+\tau}}-\frac{1}{A_{i,t+\tau-1}}\right]$			
	Before Rating Changes		**After Rating Changes**		**Before Rating Changes**		**After Rating Changes**	
	τ **= -1**	τ **= 0**	τ **= 2**	τ **= 3**	τ **= -1**	τ **= 0**	τ **= 2**	τ **= 3**
Intercept	0.13186***	0.1421***	0.26743***	0.2674***	-0.00291***	-0.00356***	-0.0037***	-0.00382***
	(3.98)	(6.30)	(17.38)	(17.37)	(-2.85)	(-4.02)	(-4.42)	(-4.57)
OR^U	0.05119	0.05632	0.08819*	0.07667	0.00027	0.00081	-0.00213	-0.00154
	(0.46)	(0.74)	(1.69)	(1.49)	(0.08)	(0.27)	(-0.75)	(-0.56)
OR^D	-0.02749	-0.0504	-0.00371	0.00268	-0.00009	0.00090	0.00299	-0.00348
	(-0.30)	(-0.80)	(-0.09)	(0.06)	(-0.03)	(0.36)	(1.31)	(-1.48)
Growth	0.05995***	0.06119***	0.06379***	0.06379***	0.00061***	0.00066***	0.00037***	0.00037***
	(34.31)	(50.79)	(76.55)	(76.55)	(11.36)	(13.81)	(8.14)	(8.14)
Leverage	-0.06065***	-0.06656**	0.08226***	0.08218***	-0.01601***	-0.01501***	-0.01573***	-0.01549***
	(-1.21)	(-1.96)	(3.57)	(3.57)	(-10.39)	(-11.25)	(-12.56)	(-12.36)
Size	0.03081***	0.02584***	-0.0085***	-0.00851***	-0.00212***	-0.0023***	-0.0021***	-0.00206***
	(4.56)	(5.60)	(-2.70)	(-2.70)	(-10.17)	(-12.71)	(-12.27)	(-12.06)
Price	-0.13233***	-0.11623***	-0.14099***	-0.14095***	0.00974***	0.01013***	0.01122***	0.01120***
	(-12.72)	(-16.51)	(-29.59)	(-29.58)	(30.36)	(36.62)	(43.32)	(43.25)
Liquidity	0.31818***	0.2691***	0.42407***	0.42409***	-0.03064***	-0.02895***	-0.03306***	-0.03294***
	(5.10)	(6.31)	(14.52)	(14.52)	(-15.93)	(-17.28)	(-20.82)	(-20.74)
Profit	-4.22471***	-4.4788***	-2.04421***	-2.04415***	0.08147***	0.08655***	0.03767***	0.03764***
	(-67.09)	(-100.76)	(-103.27)	(-103.27)	(41.83)	(49.40)	(34.90)	(34.87)
Dividends	0.22735	1.35765***	1.11633***	1.11641***	-0.00858	-0.02947***	-0.02190*	-0.02181*
	(0.90)	(4.43)	(5.35)	(5.35)	(-1.10)	(-2.45)	(-1.94)	(-1.93)
Earnings	0.2933***	0.28887***	0.31406***	0.31406***	0.00058***	0.00061***	0.00067***	0.00067***
	(184.58)	(268.35)	(403.86)	(403.86)	(11.69)	(14.31)	(15.71)	(15.70)
Tangibility	0.04009	0.03088	-0.06066***	-0.06059***	0.01307***	0.01413***	0.01286***	0.01291***
	(0.77)	(0.87)	(-2.52)	(-2.52)	(8.16)	(10.18)	(9.84)	(9.87)
NDTS	0.52410	0.30598	0.30841*	0.30804*	-0.10157***	-0.10413***	-0.10944***	-0.10912***
	(1.51)	(1.29)	(1.90)	(1.90)	(-9.51)	(-11.21)	(-12.45)	(-12.42)
Adj R-square	0.1359	0.2500	0.4101	0.4101	0.0177	0.0247	0.0232	0.0232
N	242,247	244,212	245,473	245,473	244,969	246,722	247,686	247,686

Chapter V

The Financing Adjustment Benefits from Delayed Credit Rating Changes

5.1 Introduction

In the previous two empirical chapters, DCRCs' effects on issuers' capital structure before the rating changes have been affirmed, which supports the hypotheses that delayed change of credit rating exists on the financial market and brings material influences to market insiders who possess superior information about delayed credit rating changes. Based upon and further developed by the research focuses, the influence of information asymmetry window opened by DCRCs may function further on the firm performance. Research development upon DCRCs' material outcomes in the previous chapters can also be confirmed by extending the transmission mechanism from DCRC to capital structure and further to firm performance.

This chapter investigates the changes in firm performance around delayed credit rating changes to assess the latter's role as a driven factor of information asymmetry. As demonstrated in the previous chapters, firms are motivated to adjust their financings before DCRCs when they possess private information to forecast rating changes accurately. Therefore, more specifically, this study tests whether and when the change in firm performance happens due to the direct effect of financing adjustment, which is driven by the DCRC created information asymmetry window. This can be achieved by designing and evaluating simultaneous equation systems.

The issue of links between information asymmetry and firm performance has been discussed and well documented in the relevant literature. Capital structure, the mainly considered intermediate factor between information asymmetry and firm performance, is under the shadow of many financial imperfections, one of which

originates from the conflicts between managers and firm's shareholders. Firm's choice of financing is one of the decision makings which have long been concerned by economists due to the incentive problem which arises from the fact that managers are not firms' security holders (Fama (1980)). Bhagat and Bolton (2008) summarise the reasons of the influence of agency problem over financing policy. Firstly, managers owning stock and stock options of the firm have their human capital tied to the firm (Fama (1980)). They may not choose the optimal capital structure when the benefit from choosing other level of leverage ratio is overwhelmed. For instance, Harris and Raviv (1988) and Stulz (1988) both argue that managers may decrease the issuance of equity in order to increase the voting power of their equity stakes, and reduce the likelihood of a takeover and its resulting possible job loss. Secondly, as suggested by Jensen (1986), a larger level of debt pre-commits the manager to work harder to generate and pay off the firm's cash flows to outside investors. High debt ratio is believed to reduce the agency cost of outsider equity.

On contrary, debt has opposite effect on firm performance since agency costs can also appear due to conflicts between debt holders and shareholders. These conflicts arise when the leverage becomes relatively high and therefore induces a risk of default, which may create what Myers (1977) referred to as an 'underinvestment' or 'debt overhang' problem. Overall, the previous studies predict that debt will have both positive and negative effect on firm performance. This study expects the impact of leverage on firm performance to be positive.

The source of information asymmetry is generally the superior knowledge that managers have but investors don't (Copeland, Weston and Shastri (2004)). In

financial markets, borrowers cannot be expected to disclose their firms' characteristics entirely to the outsiders since there may be substantial rewards for exaggerating positive qualities (Leland and Pyle (1977)). Healy and Palepu (2001) claim that the disclosure of information by management can be voluntary within regulations' allowed range, which indicates that firm managers may choose to convey favourable information to the market but hide unfavourable information. The recent study Tang (2009) extends the research to the credit market through a specific event, Moody's credit rating format refinement in 1982. The research believes that firms' financing and investment decisions are affected by information asymmetry in the credit market since the latter significantly affects firms' real outcomes. So far, the information asymmetry has been concretised as the information of credit rating changes.

The delayed credit rating change is considered as the main source of asymmetric information between insiders and the market in this chapter. Rating agencies and their publicly announced ratings were originally in demand for uncovering managers' superior information (Healy and Palepu (2001)), thus bridging the information gaps between insiders and outsiders in the financial market. However, delayed updates in credit ratings by rating agencies have drawn the attention of market participants, especially following the significant episodes of Enron [64], WorldCom and Lehman Brothers. DCRCs cause the information asymmetry between issuers and the market since the former, as insiders, are able to forecast their rating changes earlier while the latter cannot, due to the lack of

[64] For example, on 20th March, 2002 the US Senate Committee held a hearing seeking to elicit information on why the credit rating agencies continued to give Enron a good credit rating until four days before the firm declared bankruptcy. The hearing report, entitled 'Rating the Raters: Enron and the Credit Rating Agencies', documents that: "in the case of Enron, credit rating agencies displayed a lack of diligence in their coverage and assessment of Enron."

issuer's privileged information. The information asymmetry on future rating changes existing between issuers and market outsiders, gives issuers both motivation and opportunity to take advantage of their superior information by adjusting their financing if they can gain benefits from the process. In particular, this study hypothesizes that firms are likely to improve their firms' performance by utilising their privileged and advantageous information on future rating changes which market outsiders do not have.

This study constructs simultaneous equation systems to test whether issuers would adjust their financing before DCRCs taking place, leading them to gain benefits reflected in the improved firm performances. The data sample in the tests includes Compustat financial data and the Standard & Poor's rating data between Q1 1985 and Q4 2010. The evidence shows that issuers significantly adjust their debt and equity financing one quarter before DCRCs and the adjustment actions improve their firm performances.

The primary finding of this chapter is that issuers do improve their firm performance through their financing adjustment before DCRCs. In particular, the test results indicate that ROA in the quarter of DCRC increases by 0.0239% for 'bad' issuers who anticipate future rating downgrade and who increase net debt issuance by 1.250% before downgrade news is announced. EPS in the quarter of DCRC increases by 1.805% for 'bad' issuers who increase net debt issuance by 1.245% before downgrade. Tobin's Q in the quarter of DCRC decreases but only at the 10% confidence level. However, 'bad' issuers gain increase of Tobin's Q one quarter after DCRC through debt financing while 'good' issuers gain this benefit through their equity financing.

The theoretical and empirical evidence explains the testable benefits of issuers' financing adjustment behaviours on firm performance. The direct effect of leverage on firm performance is stipulated by Jensen and Meckling (1976), in which the agency cost is addressed as the linking factor. An early study Leland and Pyle (1977) investigates that lack of precise and timely information transfer may cause poor performance of the market. As observed in Chapter III, an issuer who could anticipate next-quarter rating changes would take advantage in cheaper financing and thus adjust the choice of financing methods (Myers and Majluf (1984)). A recent study argues that leverage adjustment influences agency cost, and hence firm performance (Berger and Bonaccorsi di Patti (2006)). The test results in this chapter show that 'bad' issuers gain improvement in firm performance through debt financing. This is in accordance to the findings in very recent studies by Korteweg (2010) and van Binsbergen, Graham and Yang (2010) who demonstrate benefits of debt financing when it can trade-off financing costs.

The rest of the chapter proceeds as follows. Section 5.2 sets up the assumptions and testable hypotheses. Section 5.3 discusses the methodology and data. Section 5.4, 5.5 and 5.6 describe estimation results for each of the three firm performance measures. Section 5.7 shows the impacts of long-term debt and short-term debt financing on firm performance. Section 5.8 concludes.

5.2 Hypotheses Development

5.2.1 The Assumptions

Since issuers are assumed to be insiders who are able to anticipate DCRCs and obtain the news of real rating change announcements by rating agencies at least one period earlier than outsiders, the former therefore can utilise this superior information to gain benefits. This chapter tests whether issuers are able to improve their firms' performances by adjusting financing one period before DCRCs. The hypotheses of tests in this chapter are based on the fundamental assumptions:

(i) credit ratings are informative, which containing pricing relevant information on shares and bonds and thus impact on issuers' overall financing costs;

(ii) issuers know more about their firm value and future growth opportunities than outsiders who are unable to forecast future rating changes[65];

(iii) issuers and raters are assumed to have the same expectation of future rating changes[66], which helps issuers to predict future rating changes at least one period before DCRC is released to the public[67].

5.2.2 The Hypotheses

As the mechanism and timeline illustrated in Figure 5.1 shows, issuers may take actions to exploit the asymmetric information driven by delayed credit rating changes. They balance the associated costs and benefits of debt and equity issuances to make a decision on the financing choices, from which they expect to

[65] The assumption comes from the statistical features of rating changes shown in Table 3.2. Since most of the observations (on average over 97% in four quarters) are 'no rating changes' and the results gained from a rating forecasting model tell that 95% forecasts are 'no rating changes', therefore it is reasonable to assume that market cannot forecast future rating changes.

[66] Kliger and Sarig (2000) argue that instead of revealing information to the public which might benefit competitors, issuers provide raters with detailed insider information during the rating process. Kisgen (2006) states 'Rating agencies may receive significant company information that is not public'. The documented close information communication between issuers and raters support the assumption (iii). S&P 'may allow for an appeal if the issuer can provide new and significant information to support it' also supports the point that issuers and raters share same information set as well as the same view of future rating changes.

[67] 'The manager's information advantage over outsider investors is large' Myers (2001). The study in this chapter assumes that issuers are able to predict their future rating change at least one period before it is announced given two conditions: they have their firm quality and finance information earlier than outsiders and the rating criteria issuers can reach easily through rating agency's public website (eg. S&P lists their criteria on www.standardandpoors.com/CriteriaTOC).

gain benefits to the firms' financial performances. Based on the evidences shown in Chapter III, 'good' issuers issue equity to a greater extent than debt before ratings upgrade while 'bad' issuers issue debt to a greater extent than equity before ratings downgrade. As a result, 'good' issuers do not significantly adjust financing before DCRCs while 'bad' issuers increase net debt issuance before DCRCs.

[Insert Figure 5.1 here]

Based on the associated costs and benefits caused by debt and equity financing as discussed in Chapter III, the following two hypotheses are:

Hypothesis 5.1*: Equity financing before DCRCs generally brings insignificant or negative effects on firm performances.*

Hypothesis 5.2*: Debt financing before DCRCs generally brings significant and positive effects on firm performances.*

5.3 Methodology and Data

5.3.1 Firm Performance Measures

The hypotheses assume that issuers adjust their financing plan before announcements in credit rating changes, through which they can improve their firms' performance. As indicated in Richard, Devinney, Yip and Johnson (2009), 'measuring performance requires weighing the relevance of performance to focal stakeholders'. Literature on measures of firm performance are various according to the analysing angles. Three measures of firm performance are adopted in this

chapter: ROA, EPS and Tobin's Q, which respectively represent measures of perspectives of managers, investors and market evaluation.

ROA (Return on Assets) is an operating performance measure (Demsetz and Lehn (1985), Gorton and Rosen (1995), Mehran (1995), Berger and Bonaccorsi di Patti (2006), and Bhagat and Bolton (2008)), which is calculated as net income divided by the total assets (comprised of both debt and equity). It indicates how profitable a company is relative to its total assets and gives an idea as to how efficient a company's management is at using the firm's assets to generate earnings. Sometimes this is referred to as 'return on investment'.

EPS (Earnings per Share) is a security analysis measure, which is often used as a considerable indicator of a firm's performance. It is calculated as the company's total earning divided by the total number of shares outstanding. It measures performance from the perspective of investors and potential investors. Since it shows the amount of earnings available to each ordinary shareholder, it indicates the potential return on individual investments. In the United States, the Financial Accounting Standards Board (FASB) requires companies' income statements to report EPS for each of the major categories of the income statement.

Tobin's Q is calculated as the market value of a company divided by the value of its total assets. It compares the firm's market value of a firm's assets, measured by the market value of its outstanding stock and debt, to the replacement cost of the firm's assets (Tobin (1969)). It has been employed to explain a number of diverse corporate phenomena, such as cross-sectional differences in investment and diversification decisions (Jose, Nichols and Stevens (1986), and Malkiel, Von

Furstenberg and Watson (1979)), the relationship between managerial equity ownership and firm value (McConnell and Servaes (1990) and Morck *et al.* (1988)), the relationship between managerial performance and tender offer gains (Lang, Stulz and Walkling (1989)), investment opportunities and tender offer responses (Lang *et al.* (1989)), financing, dividend, and compensation policies (Smith and Watts (1992)) and the corporate governance context (Bhagat and Bolton (2008), and Bebchuk, Cohen and Ferrell (2009))[68]. In this chapter, Tobin's Q is used as a proxy of operating performance of corporate governance, as it is widely used in previous studies. Yermack (1996) analyses board performance using Tobin's Q while Anderson and Reeb (2003) employ Tobin's Q to examine the governance of family firms.

5.3.2 Empirical Design

In order to investigate the issuer's benefits, in this study, particularly firms' financial performance improvements gained from financing adjustment before DCRCs, a number of simultaneous equations are conducted to test the relations among the three factors: DCRCs, debt and equity financing adjustments before DCRCs and firm performance.

The two-equation system below is designed to examine the effect of financing adjustment before DCRCs on changes in firm performance in the periods around DCRCs. The first equation in the simultaneous equation system tests the *DCRC* effect by regressing security issuance against delayed credit rating changes and

[68] Several recent papers are skeptical about the role of Tobin's Q as a firm performance measure. For instance, Erickson and Whited (2011) and Erickson and Whited (2006) argue that Tobin's Q is likely to contain a great deal of measurement error as a proxy of unobservable investment opportunities. Dybvig and Warachka (2010) argue that Tobin's Q does not measure performance and high Tobin's Q thus may not be the evidence of good firm performance.

control variables, and the second equation tests *Benefit* effect by regressing changes in firm performance measure on firms' security issuance. To investigate the changes in firm performance in the periods around DCRCs, tests for three periods are designed. The *3SLS*[69] method is applied to estimate the coefficients in the two-equation system.

DCRC effect $$\Delta issue_{i,t} = \pi_0 + \pi_1 I^U_{i,t+1} + \pi_2 I^D_{i,t+1} + \boldsymbol{\pi_c X_{i,t-1}} + w_{i,t} \quad (5.1a)$$

Benefit effect $$\Delta Y_{i,t+\tau} = \mu_0 + \mu_1 \Delta issue_{i,t} + \boldsymbol{\mu_c^{(\tau)} X_{i,t+\tau-1}} + v_{i,t+\tau} \quad (5.1b)$$

$$(\tau = 0,1,2)$$

where $\Delta issue_{i,t+\tau}$ is the financing asjustments of issuer *i* at quarter $t+\tau$, $\Delta Y_{i,t+\tau}$ is the change in firm performance measures for issuer *i* between quarter $t+\tau-1$ and $t+\tau$, and $\boldsymbol{X_{i,t+\tau-1}}$ is the vector of the control variables issuer *i* at quarter $t+\tau-1$. The rating change dummy variables in the regression equation (5.1a) are defined as:

$$I^U_{i,t+1} = \begin{cases} 1, & r_{i,t+1} > r_{i,t} \\ 0, & otherwise \end{cases}$$
$$I^D_{i,t+1} = \begin{cases} 1, & r_{i,t+1} < r_{i,t} \\ 0, & otherwise \end{cases} \quad (5.2)$$

$r_{i,t}$ and $r_{i,t+1}$ in the definition (5.2) are the ratings of the issuer *i* at quarters *t* and *t+1*, respectively. The control vector $\boldsymbol{X_{i,t}}$ in the equation system contains the conventional variables found in capital structure literature: *Leverage, Size, Price, Liquidity, Profit, Dividends, Earnings, Growth, Tangibility* and *NDTS (non-debt tax shields)* to separate their influences from DCRC on firms' financing decisions. The

[69] For the two-equation system, the results given by 2SLS are the same as those given by 3SLS since all the equations are just identified (Kapteyn and Fiebig (1981)). For the three-equation system, the results given by 2SLS are similar to those given by 3SLS, which indicate that 3SLS is done properly. 3SLS's disadvantage is that the estimation for single equation is potentially less robust. However, the influences of DCRCs on firm performance in this study are given by the combined results of the whole equation system rather than individual equation in the simultaneous equation.

dependant variable $\Delta Y_{i,t+\tau}$ in equation (5.1b) is specified as *Return on Assets (ROA)*, *EPS* and *Tobin's Q* in this study.

The coefficients $\{\pi_1, \pi_2\}$ indicate the current-quarter financing adjustments in response to the expectation differences in next-quarter rating upgrades and downgrades respectively due to the information gap between insiders and outsiders. $\boldsymbol{\pi_c}$ and $\boldsymbol{\mu_c^{(\tau)}}$ are the vectors of coefficients on the control variables in equations (5.1a) and (5.1b) respectively. In equation (5.1b), μ_1 is the impact of financing adjustments on firm performance.

Based on the two-equation system, the change in firm performance $\Delta Y_{i,t+\tau+1}$ due to the delayed credit rating changes are derived as:

$$\begin{aligned}\Delta Y_{i,t+\tau} &= \mu_0 + \mu_1 \Delta issue_{i,t} + \boldsymbol{\mu_c^{(\tau)}} \boldsymbol{X_{i,t+\tau-1}} \\ &= \mu_0 + \mu_1(\pi_0 + \pi_1 I_{i,t+1}^U + \pi_2 I_{i,t+1}^D + \boldsymbol{\pi_c X_{i,t-1}}) + \boldsymbol{\mu_c^{(\tau)} X_{i,t+\tau-1}}\end{aligned} \tag{5.3a}$$

$$\Delta Y_{i,t+\tau} | I_{i,t+1} = \mu_1(\pi_1 I_{i,t+1}^U + \pi_2 I_{i,t+1}^D) = \begin{cases} \mu_1\pi_1, & if \quad I_{i,t+1}^U = 1 \\ \mu_1\pi_2, & if \quad I_{i,t+1}^D = 1 \end{cases} \tag{5.3b}$$

(τ =0,1,2)

where $I_{i,t+1}$ in (5.3b) is the summary notation of $I_{i,t+1}^U$ and $I_{i,t+1}^D$.

5.3.3 Data and Sample

Data is collected from quarterly firm financials and monthly Standard & Poor (S&P) rating data from Compustat North America, which comprises more than 30,000 active and inactive publicly listed firms in the U.S. and Canada. Quarterly rating change indicators are derived from the monthly rating data[70] and amalgamated with

[70] I sum up values of *monthly* rating change indicators by quarters and define the *quarterly* rating indicators as '1' if the sum of the added *monthly* value greater than 0, otherwise it is defined as '0'. This means that the

the quarterly financial data. The sample covers all firms with quarterly financial data and at least one rating record during the sample period: Q1 1985 (when the rating data begins in Compustat) to Q4 2010. The firm-quarter observations with negative equity (leverage greater than one) are excluded.

The final sample for the empirical tests further excludes utility companies (SIC 4000-4999) and financial companies (SIC 6000-6999) as with conventional treatments. Myers (2001) points out that these companies have a narrower menu of financing choices and cannot adjust their capital structures at relatively low cost. Regulations related to the disclosure policy of financial firms are usually stricter than non-financial firms and hence decrease the advantages of superior information of financial firms relative to outsiders, which in turn, de-motivate these firms from making financing adjustments. In addition, in tests of utility companies and financial companies, DCRCs are not revealed to have significant effects on financing around the four periods of DCRCs. Tests for the two groups are thus not meaningful in this chapter.

5.3.4 Dependent Variables

The study examines the effects on *debt issuance*, *equity issuance* and *net debt issuance*, which are defined as follows:

$\Delta det_{i,t} = \frac{\Delta D_{i,t}}{A_{i,t-1}}$: *debt issuance*, where $\Delta D_{i,t}$ is long-term debt issuance (Compustat DLTISY) [71] minus long-term debt reduction (Compustat DLTRY) plus changes in current debt (Compustat

quarterly rating indicator is equal to '1' when rating changes take place in any month of the quarter, while is equal to '0' when rating changes do not take place in any month of the quarter.

[71] The last letter 'Y' in DLTISY indicates that the variable is year-to-date. Quarterly values of observations for all variables comprised of year-to-date data is derived.

DLCCHY) for firm *i* in quarter *t*, and $A_{i,t-1}$ is total asset (Compustat ATQ) of firm *i* in quarter *t-1*.

$\Delta eqt_{i,t} = \frac{\Delta E_{i,t}}{A_{i,t-1}}$: *equity issuance*, where $\Delta E_{i,t}$ is the sale of common and preferred stock (Compustat SSTKY) minus purchases of common and preferred stock (Compustat PRSTKCY) for firm *i* in quarter *t*.

$\Delta net_{i,t} = \frac{\Delta D_{i,t} - \Delta E_{i,t}}{A_{i,t-1}}$: *net debt issuance* (as in Kisgen (2006)) is the difference between $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$.

Further details of *debt issuance* and an examination of the effects of short-term and long-term debt respectively:

$\Delta Sdet_{i,t} = \frac{\Delta SD_{i,t}}{A_{i,t-1}}$, where $\Delta SD_{i,t}$ is the change in current debt (Compustat DLCCHY) for firm *i* in quarter *t*.

$\Delta Ldet_{i,t} = \frac{\Delta LD_{i,t}}{A_{i,t-1}}$, where $\Delta LD_{i,t}$ is long-term debt issuance (Compustat DLTISY) minus long-term debt reduction (Compustat DLTRY) for firm *i* in quarter *t.*

The dependant variables in the benefit equation measuring changes in firm performance are:

$\Delta ROA_{i,t+1} = ROA_{i,t+1} - ROA_{i,t}$, change in Return on Asset, where $ROA_{i,t+1}$ is the ratio of net income (Compustat NIQ) to total assets (Compustat ATQ) for firm *i* in quarter *t+1*.

$\Delta EPS_{i,t+1} = EPS_{i,t+1} - EPS_{i,t}$: change in earnings per share, where $EPS_{i,t+1}$ is the earnings per share (Compustat EPSPXQ) for firm *i* in quarter *t+1*.

$\Delta TobinQ_{i,t+1} = TobinQ_{i,t+1} - TobinQ_{i,t}$: change in Tobin's Q, where $TobinQ_{i,t+1}$ is the ratio of total debt book value plus quarterly close price (Compustat PRCCQ) multiplied by outstanding common stock shares (Compustat CSHOQ) to total assets (Compustat ATQ) for firm *i* in quarter *t+1*, which is the same with one of the control variables $Growth_{i,t}$ defined in the section 5.3.6.

5.3.5 Indicators for Upgrade and Downgrade

In order to indicate ratings upgrade and downgrade for firm *i* in quarter *t*+1, two sets of dummy variables are constructed. Each set consists of three dummy variables associated with the S&P ratings of long-term debt, short-term debt and subordinated debt. They are, respectively, Domestic Long-Term Issuer Credit Rating (Compustat SPLTICRM), Domestic Short-Term Issuer Credit Rating (SPSTICRM) and Subordinated Debt Rating (SPSDRM), in this study.

$LTD^{U}_{i,t+1}, STD^{U}_{i,t+1}\ and\ SUB^{D}_{i,t+1}$: dummy variables for ratings upgrade. They are equal to 1 if the individual ratings of SPLTICRM, SPSTICRM and SPSDRM of firm *i*, respectively, are upgraded in quarter *t+1*.

$LTD^{D}_{i,t+1}, STD^{D}_{i,t+1}\ and\ SUB^{D}_{i,t+1}$: dummy variables for ratings downgrade. They are equal to 1 if the

individual ratings SPLTICRM, SPSTICRM and SPSDRM of firm *i*, respectively, are downgraded in quarter *t+1*.

It is plausible that firm managers are not only concerned about a change in any of the above three ratings, but also about an overall outcome of the firm's future ratings. To simplify the tests with the *overall* rating upgrade and downgrade in this chapter, two dummy variables are constructed below:

$OR^{U}_{i,t+1}$ = 1 if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing upgrade, and (ii) more individual ratings showing upgrade than downgrade.

$OR^{D}_{i,t+1}$ = 1 if the individual ratings of firm *i* in quarter *t*+1 satisfy two conditions: (i) at least one of the individual ratings showing downgrade, and (ii) more individual ratings showing downgrade than upgrade.

5.3.6 Control Variables

Control variables, conventionally considered in capital structure studies[72], include *Leverage, Size, Price, Liquidity, Profit, Dividends, Earnings, Growth, Tangibility*

[72] Kisgen (2006) shows significant negative relations between *leverage* and debt issuance. Titman and Wessels (1988) show that firm *size*, as indicated by logarithm of sales, is one of the crucial determinants of capital structure. Marsh (1982) shows that changes in security *prices* alter debt/equity ratios. Wald (1999), Myers (2001), and Fama and French (2002) demonstrate that *profit* is an important factor that impacts capital structure. Market-to-book ratio (defined as *growth* in this study) and *tangibility* are variables affecting leverage ratio in Rajan and Zingales (1995). *Dividends* (Barclay, Smith and Watts (1995) and Titman and Wessels (1988)) and *earnings* (Titman and Wessels (1988)) policy tightly relate to debt issuance and equity sale. *liquidity* (see Kim, Mauer and Sherman (1998)) is included to control for possible impacts on leverage from firm's cash/liquidity positions and *NDTS* (*non-debt tax shields*), which is considered as an impact on optimal leverage level (DeAngelo and Masulis (1980) and Bradley, Jarrell and Kim (1984)) and may have a negative influence on leverage.

and *NDTS (non-debt tax shields)* to separate their influences from DCRCs on firms' financing decisions.

$Leverage_{i,t}$: ratio of the sum of short-term debt (*Sdet*) (Compustat DLCQ) and long-term debt (*Ld*) (Compustat DLTTQ) to the sum of short-term debt, long-term debt, and stockholders' equity (Compust LSEQ minus LTQ) for firm *i* in quarter *t*.

 : logarithm of sales (Compustat SALEQ) for firm *i* in quarter *t*.

$Price_{i,t}$: logarithm of the quarterly close price in the quarter (Compustat PRCCQ) for firm *i* in quarter *t*.

$Liquidity_{i,t}$: ratio of cash and cash equivalent (Compustat CHEQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

 $Profit_{i,t}$: ratio of EBITDA[73] to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Dividends_{i,t}$: ratio of dividends (Compustat DVY) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Earnings_{i,t}$: ratio of Retained Earnings (Compustat REQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$Growth_{i,t}$: ratio of total debt book value plus quarterly close price (Compustat PRCCQ) multiplied by outstanding common stock shares (Compustat CSHOQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

[73] $EBITDA_{i,t}$ is the earnings before interest, tax, depreciation and amortization for firm *i* at time *t*, which calculated as the sum of Pretax Income (Compustat PIQ), Inertest Expense (Compustat TIEQ) and Depreciation and Amortization (Compustat DPQ).

$Tangibility_{i,t}$: ratio of Property Plant and Equipment (Net) (Compustat PPENTQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

$NDTS_{i,t}$: ratio of Deferred Taxes and Investment Tax Credit (Compustat TXDITCQ) to total assets (Compustat ATQ) for firm *i* in quarter *t*.

5.3.7 Regression Models

To specify the variables in the empirical design section, net debt issue $\Delta net_{i,t+\tau}$ is substituted into (5.1a) as the dependent variable and $OR^{U}_{i,t+1}$ and $OR^{D}_{i,t+1}$ are specified as rating change dummies. The *3SLS* method is applied to estimate the coefficients in the two-equation system.

$$\Delta net_{i,t} = \alpha_0 + \alpha_1 OR^{U}_{i,t+1} + \alpha_2 OR^{D}_{i,t+1} + \boldsymbol{\alpha_c X_{i,t-1}} + w_{i,t} \quad (5.4a)$$

$$\Delta Y_{i,t+\tau} = \mu_0 + \mu_1 \Delta net_{i,t} + \boldsymbol{\mu_c^{(\tau)} X_{i,t+\tau-1}} + v_{i,t+\tau} \quad (5.4b)$$

$(\tau = 0,1,2)$

The dependent variable $\Delta Y_{i,t+\tau}$ in equation (5.4b) is specified as *Return on Assets (ROA)*, *EPS* and *Tobin's Q* and is tested individually (this also refers to the equation systems below if not specified otherwise).

To further test the influences on firm performance from $\Delta det_{i,t+\tau}$ and $\Delta eqt_{i,t+\tau}$ separately, the two two-equation systems are employed below:

$$\Delta det_{i,t} = \beta_0 + \beta_1 OR^{U}_{i,t+1} + \beta_2 OR^{D}_{i,t+1} + \boldsymbol{\beta_c X_{i,t-1}} + w_{i,t} \quad (5.5a)$$

$$\Delta Y_{i,t+\tau} = \mu_0{}^{d} + \mu_1{}^{d} \Delta det_{i,t} + \boldsymbol{\mu_c^{d(\tau)} X_{i,t+\tau-1}} + v_{i,t+\tau} \quad (5.5b)$$

$(\tau = 0,1,2)$

$$\Delta eqt_{i,t} = \gamma_0 + \gamma_1 OR^{U}_{i,t+1} + \gamma_2 OR^{D}_{i,t+1} + \boldsymbol{\gamma_c X_{i,t-1}} + w_{i,t} \quad (5.6a)$$

$$\Delta Y_{i,t+\tau} = \mu_0{}^{e} + \mu_1{}^{e}\Delta eqt_{i,t} + \boldsymbol{\mu_c^{e(\tau)}}\boldsymbol{X_{i,t+\tau-1}} + v_{i,t} \quad (5.6b)$$

(τ =0,1,2)

where the dependent variable $\Delta Y_{i,t+\tau}$ in equation (5.5b) and (5.6b) are again specified as *Return on Assets (ROA)*, *EPS* and *Tobin's Q* and tested individually.

Alternatively, a three-equation system is created to test the separate effects from $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$ and is used to confirm the robustness of the two-equation system (5.5a) (5.5b) and (5.6a) (5.6b):

$$\Delta det_{i,t} = \beta_0 + \beta_1 OR^{U}_{i,t+1} + \beta_2 OR^{D}_{i,t+1} + \boldsymbol{\beta_c}\boldsymbol{X_{i,t-1}} + \epsilon_{i,t} \quad (5.7a)$$

$$\Delta eqt_{i,t} = \gamma_0 + \gamma_1 OR^{U}_{i,t+1} + \gamma_2 OR^{D}_{i,t+1} + \boldsymbol{\gamma_c}\boldsymbol{X_{i,t-1}} + \varepsilon_{i,t} \quad (5.7b)$$

$$\Delta Y_{i,t+\tau} = \mu_0 + \mu_1{}^{d}\Delta det_{i,t} + \mu_1{}^{e}\Delta eqt_{i,t} + \boldsymbol{\mu_c^{(\tau)}}\boldsymbol{X_{i,t+\tau-1}} + \vartheta_{i,t+\tau} \quad (5.7c)$$

(τ =0,1,2)

$\{\beta_1, \beta_2\}$ and $\{\gamma_1, \gamma_2\}$ respectively indicate adjustments of the ratios $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$ in response to delayed credit rating upgrades and downgrades. $\boldsymbol{\beta_c}$ and $\boldsymbol{\gamma_c}$ (*c=3,4,…, 12*) are respectively the vectors of coefficients on the control variables in equation (5.7a) and (5.7b). $\mu_1{}^{d}$ indicates the impact of $\Delta det_{i,t}$ on firm performance and $\mu_1{}^{e}$ indicates that of $\Delta eqt_{i,t}$ on firm performance in (5.7c). The change in firm performance $\Delta Y_{i,t+\tau}$ derived from the three-equation system is:

$$\begin{aligned}\Delta Y_{i,t+\tau} &= \mu_0 + \mu_1{}^{d}\Delta det_{i,t} + \mu_1{}^{e}\Delta eqt_{i,t} + \boldsymbol{\mu_c^{(\tau)}}\boldsymbol{X_{i,t+\tau-1}} \\ &= \mu_0 + \mu_1{}^{d}(\beta_0 + \beta_1 OR^{U}_{i,t+1} + \beta_2 OR^{D}_{i,t+1} + \boldsymbol{\beta_c}\boldsymbol{X_{i,t-1}}) \\ &+ \mu_1{}^{e}(\gamma_0 + \gamma_1 OR^{U}_{i,t+1} + \gamma_2 OR^{D}_{i,t+1} + \boldsymbol{\gamma_c}\boldsymbol{X_{i,t-1}}) + \boldsymbol{\mu_c^{(\tau)}}\boldsymbol{X_{i,t+\tau-1}}\end{aligned} \quad (5.8a)$$

$$\Delta Y_{i,t+\tau}|OR_{i,t+1} = \begin{cases} {\mu_1}^d\beta_1+{\mu_1}^e\gamma_1, & if \quad OR_{i,t+1}^U = 1 \\ {\mu_1}^d\beta_2+{\mu_1}^e\gamma_2, & if \quad OR_{i,t+1}^D = 1 \end{cases} \tag{5.8b}$$

(τ =0,1,2)

where $OR_{i,t+1}$ is the summary notation of $OR_{i,t+1}^U$ and $OR_{i,t+1}^D$. In particular, the performance changes due to debt financing and equity financing are derived respectively:

$$\Delta Y_{i,t+\tau}|(\Delta det_{i,t}|OR_{i,t+1}) = \begin{cases} {\mu_1}^d\beta_1, & if \quad OR_{i,t+1}^U = 1 \\ {\mu_1}^d\beta_2, & if \quad OR_{i,t+1}^D = 1 \end{cases}$$

$$\Delta Y_{i,t+\tau}|(\Delta eqt_{i,t}|OR_{i,t+1}) = \begin{cases} {\mu_1}^e\gamma_1, & if \quad OR_{i,t+1}^U = 1 \\ {\mu_1}^e\gamma_2, & if \quad OR_{i,t+1}^D = 1 \end{cases}$$

(τ =0,1,2)

To further understand DCRCs' effects on firm performance through long-term debt issue $\Delta Ldet_{i,t+\tau}$ and short-term debt issue $\Delta Sdet_{i,t+\tau}$ adjustment, a three-equation system is constructed to examine the effects. The first two equations test DCRCs' influences on long-term debt issue and short-term debt issue, and the third equation tests the influence of debt ratios on firm performance.

$$\Delta Ldet_{i,t+\tau} = {\beta_0}^L+{\beta_1}^L OR_{i,t+1}^U + {\beta_2}^L OR_{i,t+1}^D + \boldsymbol{\beta_c}^{\boldsymbol{L}}\boldsymbol{X_{i,t-1}} + \epsilon_{i,t} \tag{5.9a}$$

$$\Delta Sdet_{i,t+\tau} = {\beta_0}^S+{\beta_1}^S OR_{i,t+1}^U + {\beta_2}^S OR_{i,t+1}^D + \boldsymbol{\beta_c}^{\boldsymbol{S}}\boldsymbol{X_{i,t-1}} + \varepsilon_{i,t} \tag{5.9b}$$

$$\Delta Y_{i,t+\tau} = \mu_0+{\mu_1}^L\Delta Ldet_{i,t}+{\mu_1}^S\Delta Sdet_{i,t} + \boldsymbol{\mu_c^{(\tau)}}\boldsymbol{X_{i,t+\tau-1}}+\vartheta_{i,t} \tag{5.9c}$$

(τ =0,1,2)

$\{{\beta_1}^L, {\beta_2}^L\}$ and $\{{\beta_1}^S, {\beta_2}^S\}$ respectively indicate adjustments of the ratios $\Delta Ldet_{i,t+\tau}$ and $\Delta Sdet_{i,t+\tau}$ in response to delayed credit rating upgrades and

downgrades. $\boldsymbol{\beta_c}^{\boldsymbol{L}}$ and $\boldsymbol{\beta_c}^{\boldsymbol{S}}$ (*c=3,4,..., 12*) are respectively the vectors of coefficients on the control variables in equation (5.9a) and (5.9b). ${\mu_1}^L$ is the impact of $\Delta det_{i,t}$ on firm performance and ${\mu_1}^S$ is that of $\Delta eqt_{i,t}$ on firm performance in (5.9c). The change in firm performance $\Delta Y_{i,t+\tau}$ the three-equation system can be similarly derived as:

$$\begin{aligned}\Delta Y_{i,t+\tau} &= \mu_0+{\mu_1}^L\Delta Ldet_{i,t}+{\mu_1}^S\Delta Sdet_{i,t}+\boldsymbol{\mu_c^{(\tau)}X_{i,t+\tau-1}}\\ &= \mu_0+{\mu_1}^L({\beta_0}^L+{\beta_1}^L OR_{i,t+1}^U+{\beta_2}^L OR_{i,t+1}^D+\boldsymbol{\beta_c}^{\boldsymbol{L}}\boldsymbol{X_{i,t-1}})\\ &+{\mu_1}^S({\beta_0}^S+{\beta_1}^S OR_{i,t+1}^U+{\beta_2}^S OR_{i,t+1}^D+\boldsymbol{\beta_c}^{\boldsymbol{S}}\boldsymbol{X_{i,t-1}})\\ &+\boldsymbol{\mu_c^{(\tau)}X_{i,t+\tau-1}}\end{aligned} \tag{5.10a}$$

$$\Delta Y_{i,t+\tau}|OR_{i,t+1} = \begin{cases}{\mu_1}^L{\beta_1}^L+{\mu_1}^S{\beta_1}^S, & if \quad OR_{i,t+1}^U=1\\ {\mu_1}^L{\beta_2}^L+{\mu_1}^S{\beta_2}^S, & if \quad OR_{i,t+1}^D=1\end{cases} \tag{5.10b}$$

(τ =0,1,2)

where $OR_{i,t+1}$ is the summary notation of $OR_{i,t+1}^U$ and $OR_{i,t+1}^D$. In particular, the performance changes due to long-term debt financing and short-term debt financing are derived respectively:

$$\Delta Y_{i,t+\tau}|(\Delta Ldet_{i,t}|OR_{i,t+1}) = \begin{cases}{\mu_1}^L{\beta_1}^L, & if \quad OR_{i,t+1}^U=1\\ {\mu_1}^L{\beta_2}^L, & if \quad OR_{i,t+1}^D=1\end{cases}$$

$$\Delta Y_{i,t+\tau}|(\Delta Sdet_{i,t}|OR_{i,t+1}) = \begin{cases}{\mu_1}^S{\beta_1}^S, & if \quad OR_{i,t+1}^U=1\\ {\mu_1}^S{\beta_2}^S, & if \quad OR_{i,t+1}^D=1\end{cases}$$

(τ =0,1,2)

5.3.8 Summary Statistics

Table 5.1 reports summary statistics of the variables applied in this chapter for the sample containing 343,096 firm-quarters. Firms on average issue more equity (normalised by total assets) of 0.033 than debt (normalised by total assets) of 0.01. The net debt issue is negative at -0.04. The average firm has a *Leverage* ratio of 0.278, a *Size* of 3.660, a *Price* of 1.984 and a *Growth* (Market-to-Book ratio) of 2.229. Other control variables are all normalised by firms' total assets. The average firm holds 17.8% of its total asset value as cash and cash equivalent (short-term investments) and distributes 0.2% of its total asset value as dividends one quarter ahead of rating changes. Firms on average have negative *Profit* (-0.009) and negative retained *Earnings* (-1.642). The average firm holds approximately 28.6% of its book value of assets in fixed assets and has a ratio of 1.9% deferred taxes and investment tax credit to total assets. Three dependent variables in benefit equations measuring changes in firm performances have a mean of 0.001 (ΔROA), 2.259 (ΔEPS) and -0.174 ($\Delta TobinQ$), respectively.

[Insert Table 5.1 here]

The following three sections, Sections 5.4, 5.5 and 5.6, respectively discuss the changes in the three firm performance measures, ROA, EPS and Tobin's Q in the three periods, one quarter before DCRC, in the quarter of DCRC and one quarter after DCRC.

5.4 ROA Changes in Response to Financing Adjustments

5.4.1 Two-equation System

In this section, the simultaneous equation system (5.4a) (5.4b) is tested. ΔROA is applied as the measure of change in firm performance and is substituted into (5.4b). Table 5.2 presents the estimates of the two-equation system with *3SLS* method.

[Insert Table 5.2 here]

The first implication from the simultaneous equation system is that issuers who anticipate rating upgrades would not adjust net debt issue before upgrades and those who anticipate rating downgrades would issue more debt than equity before downgrades. The coefficient estimate on delayed rating upgrades α_1 in (5.4a) is not significant while that on rating downgrades α_2 is 0.01148 and is significant at the 5% level with a *t-statistic* of 2.14. The estimates indicate that 'good' issuers do not significantly adjust net debt issue before anticipated future upgrades while 'bad' issuers increase net debt issue by around 1.148% as the percentage of total asset before anticipated downgrades. This is consistent with the results in the previous chapters. The second implication is that the adjustments of financing grant real benefits to issuers, which is tested through equation (5.4b). The estimate of coefficient μ_1 is not significant (t= -1.64), which suggests that issuers financing adjustments before DCRC do not bring them immediate financial benefits in the period of financing adjustment.

Examining the system in the next period *(τ =1)*, the period when DCRCs take place, the signs of rating dummies remain the same as in the last period: α_1 is insignificant and α_2 is significantly positive at the 1% level. The coefficient μ_1 in this period is 0.01910 and is significant at the 1% level. Equation (5.3b) quantifies the benefit from the change of the firm performance due to DCRCs by the

calculations based on coefficient estimates in the two-equation system. $\Delta Y_{i,t+1}$, the *ROA* change between time *t* and *t+1*, does not significantly increase for 'good' issuers while it significantly increases by 0.024% for 'bad' issuers. The estimation result of the simultaneous equation system encompassing equations (5.4a) and (5.4b) present a picture of the overall transmission effects of DCRCs and the benefits on firms' return efficiency.

When the test is conducted in the period one quarter after DCRC, neither of the coefficients on rating dummies are significant. Even if the coefficient on net debt issue is significant in (5.4b), it is not systematically directly driven by DCRCs. The insignificant systematical change in ROA conveys that the improvement in ROA from net debt issuance adjustment only prevails temporarily.

The two new equation systems (5.5a) (5.5b) and (5.6a) (5.6b) are created when the dependant variable $\Delta det_{i,t}$ in (5.4a) is broken down into $\Delta det_{i,t}$ and $\Delta eqt_{i,t}$. Table 5.3 and 5.4 present the estimate results of the three periods around DCRCs for the two systems respectively. Panel A of Table 5.3 shows the results in the quarter one quarter before DCRC. The estimates of the first equation show that both 'good' and 'bad' issuers increase their debt issuance in the quarter before DCRC while the coefficient estimate on debt issuance in the second equation is statistically significantly negative at -1.57012, suggesting that ROA significantly decreases. However, as shown in the last two rows in the table, the estimates of the equation system reveal that the ROA drop of 'good' issuers (-0.00912) is less than that of 'bad' issuers (-0.02822)[74]. Panel B of Table 5.3 shows the results in the quarter of

[74] The result is robust when regression (5.5b) *(τ =0)* is run individually. The coefficient on ΔROA is -0.03183 with *t-statistic* of -3.16, which indicates that ROA drops one quarter before DCRC in general without the drive

DCRC. The ROA change gained from the estimates of the system indicates that 'good' issuers' ROA does not significantly increase after the financing adjust, while 'bad' issuers' ROA increases on average by 0.234%. The result shown in Panel C of Table 5.3 implies that the increase of ROA driven by debt issuance seems temporary and does not last for more periods. Summarising the results listed in Table 5.3 shows that ROA of 'good' issuers significantly decreases in the quarter before DCRC but does not drop in the following periods. ROA of 'bad' issuers decreases in the quarter before DCRC, while increasing in the quarter of DCRC due to the adjustment of debt issuance before DCRC, which indicates that they gain real benefits on return efficiency through financing adjustment when they have private information on future rating changes.

[Insert Table 5.3 here]

Table 5.4 shows the changes in ROA due to the adjustments of equity issue. Panel A of Table 5.4 shows that ROA drops before DCRCs, however, the drop of 'good' issuers is less than the drop of 'bad' issuers in both significance and magnitude. Panel B of Table 5.4 shows that 'good' issuers tend to increase equity issue moderately before DCRC but it seems the equity issuance does not drive ROA increase. 'Bad' issuers do not significantly increase equity issuance in the period, which is consistent with the results of previous chapters. Panel C of Table 5.4 shows ROA decreases for both 'good' and 'bad' issuers. The result indicates that the usage of equity financing before DCRC might bring benefits through decreasing the magnitude of ROA drops.

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of DCRCs.

[Insert Table 5.4 here]

5.4.2 The Control Variables in the Two-equation System

The coefficient estimates on control variables in the one quarter before DCRCs (when $\tau = 0$) in equation (5.4a) are listed in Panel A of Table 5.2. They are consistent with those from the equation estimations in Chapter III. For example, the negative coefficient -0.02734 (t = -9.71) on leverage indicates that *Leverage* brings significantly negative effects on net debt issuance in the quarter, i.e., firms with higher leverage issue less debt than equity. The coefficient on *Size* is 0.00868 with the *t-statistic* of 24.32, indicating that firm size is positively and significantly related to the net debt issue. Larger firms generally have fewer concerns of financial distress and can afford transaction costs and thus issue more debt. *Price* is negatively and significantly related to net debt issue, which is in line with the market timing theory that issuers prefer equity to debt when *Price* is high. The net debt issue decreases 0.703% when quarterly close price increases 1 unit. The negative coefficient (-0.01814) on *Liquidity* indicates that firms with cash and short-term investment opportunities choose equity issue rather than debt issue. Profitable firms have more internal financing available (Myers (2001)). *Profit* thus negatively correlates to both external debt (-0.02790) and equity (-0.15957), which results in the significant positive coefficient on net debt issuance. *Retained earnings*, measuring the amount of internal funds, shows a positive and significant coefficient of 0.00108 on net debt issuance. Firms with retained earnings tend to finance projects internally (Dittmar and Thakor (2007)). The positive coefficient on net debt issuance is due to greather decrease in the level of equity issuance (-0.00157) than that of debt issuance (-0.00015). Firms holding valuable *Growth* opportunities, as

proxied by the market-to-book ratio in Rajan and Zingales (1995), tend to use a greater amount of equity finance than debt and thus overall borrow less (Myers (1984), Barclay *et al.* (1995), Rajan and Zingales (1995), and Barclay and Smith (1999)). *Tangibility* is positively related to both debt and equity issues while in response to 1 unit increase of *Tangibility* the increase a range to debt issue is higher than that to equity issue, which results in its positive relation to net debt issuance. *NDTS* is negatively related to both debt issuance (-0.02594) (DeAngelo and Masulis (1980), and Bradley *et al.* (1984)) and equity issuance (-0.03145), it thus positively impacts net debt issuance but not significantly.

In particular, comparing the three panels in Table 5.2, the coefficient estimates on *Leverage, Size, Liquidity and Earnings* are significant and keep the same positive or negative signs in both equations in the three quarters. For instance, the coefficients on *Leverage* and *Liquidity* are always negative, which indicates that firms with greater leverage ratio and higher cash flow decrease net debt issuance and *ROA*. Firms with greater *Size* and *Earnings* tend to lift up net debt issuance and *ROA*.

In contrast, *Price* shows opposite effects to net debt issuance and *ROA*. Firms with higher equity price may issue more equity, thus reducing net debt issuance. However, firms with higher price tend to gain higher *ROA* in the next period. *Profit* is positively related to net debt issuance which is consistent with the results in Chapter III and the relevant literature. Yet, it is significantly negative correlated to $\Delta ROA_{t+\tau}$ when τ *=1* and *2,* which implies that profit is negatively correlated with changes in ROA. *Dividend*'s effect is not significant to net debt issuance but positively significant to improved *ROA*. The negative estimates for *Growth* in (5.4a)

in all periods indicate that firms with high growth opportunities tend to decrease the net debt issuance in the next period. However, the estimates on *Growth* in (5.4b) show different signs and significances. The significant *Growth* estimate in the period of DCRC *(τ =1)* shows that growth is positively correlated with an increase of *ROA*. *NDTS* is negatively associated to net debt issuance but is positively related to *ROA* improvements.

5.4.3 Three-equation System

To examine the robustness of the results from the two-equation system, the three-equation system (5.7a)-(5.7c) is implemented. $\Delta Y_{i,t+\tau}$ in (5.7c) is substituted by $\Delta ROA_{i,t+\tau}$ in this section. The three panels in Table 5.5 present the results for three periods around DCRCs respectively.

[Insert Table 5.5 here]

The last two rows in Panel A of Table 5.5 shows that the changes in ROA, driven by financing adjustments before DCRC, are not significant for both 'good' and 'bad' issuers. The evidence is consistent when breaking down net debt issuance into debt issuance and equity issuance. This is caused by the insignificant coefficient estimates on debt and equity issuance in (5.7c). The insignificant effects indicate that financing adjustments do not immediately improve ROA. Panel B of Table 5.5 shows that only 'bad' issuers increase debt issuance before DCRC, while neither of them significantly increases equity issuance in the quarter. The coefficient on debt issue in (5.7c) is statistically significantly positive at the 1% confidence level while that on equity issue is not significant. These coefficients bring the inference in the last two rows in the panel that 'good' issues' ROA does

not significantly change while 'bad' issuers' ROA increases by 0.208% in the period of DCRC being announced due to the increase of debt issuance. Panel C of Table 5.5 shows that the signs and significances of coefficients on debt issue and equity issue are the same as those in Panel B. The coefficient on debt issue in (5.7c) is significantly positive while that on equity issue is significantly negative. The overall change in ROA is not significant to 'good' issuers while it is positive at 0.171% to 'bad' issuers driven by net debt issuance.

In summary, comparing the results of the three two-equation systems (5.4a) (5.4b), (5.5a) (5.5b) and (5.6a) (5.6b) with the three-equation system (5.7a)-(5.7c), the signs and significances of ROA changes shown by the equation systems appear to be consistent only for the period when the DCRCs are announced. The results imply that 'bad' issues' ROA improves in the quarter of DCRC being announced to the public, although the improvement may be temporary. This is consistent with Hypothesis 5.2 that 'bad' issuers gain improvement in firm performance by utilising private information about future rating downgrade.

5.5 EPS Change in Response to Financing Adjustments

5.5.1 Two-equation System

This section examines the changes in EPS by testing simultaneous equation system (5.5a) (5.5b). ΔEPS is applied as the measure of change in firm performance and is substituted into (5.4b). Table 5.6 presents the estimates of the two-equation system with *3SLS* estimation.

[Insert Table 5.6 here]

Panel A of Table 5.6 shows that the coefficient estimate on delayed rating upgrades α_1 in (5.4a) is not significant while that on rating downgrades α_2 is 0.01079 and is significant at the 5% level with a *t-statistic* of 1.99. The estimates indicate that 'good' issuers do not significantly adjust net debt issue before anticipated future upgrades while 'bad' issuers increase net debt issue by around 1.079% as the percentage of total asset before anticipated downgrades. It is again consistent with the results in the previous chapters. The estimate of coefficient μ_1 in the second equation (5.4b) is not significant (t = -0.58), suggesting that issuers financing adjustments before DCRC do not bring them financial benefits immediately.

Examining the system in the period of DCRC taking places, the signs and significances of the rating dummies, shown in Panel B of Table 5.6, remain the same as in the last period: α_1 is insignificant and α_2 is positive at the 1% level. The coefficient μ_1 in this period is 1.44935 with *t-statistic* of 3.66. The overall change of EPS through the equation system between time t and $t+1$, quantified by (5.3b), does not significantly increase for 'good' issuers while it significantly increases by 1.805% for 'bad' issuers. As shown in Panel C of Table 5.6, the overall changes in EPS calculated according to (5.3b) are not significant due to the insignificant coefficients on the rating dummies. The coefficient estimates on control variables in equation (5.4a) are consistent with those from the equation estimations in Chapter III.

Table 5.7 and 5.8 respectively present the results of the two equation systems (5.5a) (5.5b) and (5.6a) (5.6b) when net debt issuance, the independent variable in the second equation, is broken down into debt issuance and equity issuance. Table

5.7 shows the changes in EPS due to the adjustments of debt financing. Panel A of Table 5.7 shows that change in EPS is not significant one quarter before DCRC, in which 'good' issuers keep debt issue unadjusted and 'bad' issuers increase debt issue. Panel B of Table 5.7 indicates the same issuer's financing behaviours with those in the last period, confirming that 'good' issuers do not issue debt while 'bad' issuers increase debt issue before DCRC. However, the coefficient on debt issue in (5.5b) is significant at the 1% level. The system derives EPS changes for 'good' and 'bad' issuers are 0.01534 and 0.06805 respectively yet only the latter is significant. The results imply that 'good' issuer's EPS does not significantly increase after the financing change while 'bad' issuers' EPS on average increases by 6.805%. The result shown in Panel C of Table 5.3 implies that the increase of EPS seems to last into the next period. 'Good' issuers again do not gain benefit while 'bad' issuers improve EPS through increasing debt issuance before DCRC.

[Insert Table 5.7 here]

Table 5.8 shows the changes in EPS due to adjustments in equity issuance. The last two rows in the three panels of Table 5.8 show that neither 'good' issuers nor 'bad' issuers gain benefit through equity financing. In particular, the results imply that 'good' issuers tend to issue extra equity moderately before DCRC but it seems the equity issuance drives down EPS. 'Bad' issuers do not significantly increase equity issue in the period, which is consistent with the results of previous chapters, and there is no change to their EPS due to equity issuance driven by DCRC. The result reminds issuers not to adopt the equity tool before DCRC if it is not urgent, as it could bring negative effects on their earnings.

[Insert Table 5.8 here]

5.5.2 Three-equation System

To examine the robustness of the results from the two-equation system, the three-equation system (5.7a)-(5.7c) is estimated. The three panels in Table 5.9 present the results for three periods around DCRCs respectively. The last two rows in Panel A of Table 5.9 show that changes in EPS are not significant for both 'good' and 'bad' issuers in the quarter before DCRC. This is consistent with the results of two-equation system estimation. This is caused by the insignificant coefficients on debt and equity issuances in (5.7c). Panel B of Table 5.9 shows that only 'bad' issuers increase their debt issues before DCRCs while both 'good' and 'bad' issuers do not significantly increase equity issuance. The coefficient on debt issue in (5.7c) is statistically significantly positive at the 1% confidence level while that on equity issue is significantly negative at the 10% level. The coefficients in the three equations of the equation system reveal the overall influences, as reported in the last two rows of the panel. 'Good' issue's EPS does not significantly change while 'bad' issuers' EPS increases by 6.678% in the period of DCRC being released and it is mainly driven by debt issuance rather than equity issuance. Panel C of Table 5.9 shows that the signs and significances of coefficients on debt issue and equity issue in equations (5.7a) and (5.7b) are the same as those in the Panel B. The coefficient on debt issuance in (5.7c) is significantly positive while that on equity issuance is insignificant. The overall change in EPS driven by net debt issuance remains significantly positive for the 'bad' issuers at 1%.

[Insert Table 5.9 here]

In brief, comparing the results from the three two-equation systems (5.4a) (5.4b), (5.5a) (5.5b) and (5.6a) (5.6b) and the three-equation system (5.7a)-(5.7c), the signs and significances of EPS changes produced by the equation systems appear to be consistent for the first two periods. Neither 'good' nor 'bad' issuers gain benefits through increases of EPS in the quarter before DCRCs are announced. In the quarter of DCRC, EPS of 'good' issuers does not significantly change. However, 'bad' issuers' EPS change is significantly positive. Unlike the change in ROA tested in the last section, the increasing trend of EPS seems to continue in the quarter after DCRC. 'Good' issuers gain improvement on EPS in a small scale. 'Bad' issuers continue to gain improvement on EPS through debt issuance. The increase of EPS is 7.747% and it is significant at the 1% level. The results imply that 'bad' issuers' EPS improvement lasts from the quarter DCRC is announced to the one quarter after DCRC.

5.6 Tobin's Q Change in Response to Financing Adjustments

5.6.1 Two-equation System

This section examines the Tobin's Q changes by testing simultaneous equation system (5.4a) (5.4b). $\Delta TobinQ$ is applied as the measure of change in firm performance and is substituted into (5.4b). Table 5.10 presents the estimates of the two-equation system with the *3SLS* method.

[Insert Table 5.10 here]

Panel A of Table 5.10 shows that the coefficient estimate on delayed rating upgrades α_1 in (5.4a) is not significant while that on rating downgrades α_2 is

0.00899 and is significant at the 10% level with a *t-statistic* of 1.71. The estimates indicate that 'good' issuers do not significantly adjust net debt issuance before anticipated future upgrades while 'bad' issuers increase net debt issuance by around 0.899% as the percentage of total asset before anticipated downgrades. It is again consistent with the results in the previous chapters. The estimate of coefficient μ_1 in the second equation (5.4b) is not significant (*t*= 0.81), suggesting that issuers financing adjustments before DCRC do not bring improvement on Tobin's Q immediately.

Examining the system in the period of DCRC taking place, the signs and significances of the rating dummies, listed in Panel B of Table 5.10, keep the same as the last period: α_1 is insignificant and α_2 is positive at the 10% level. The coefficient μ_1 on net debt issuance in this period is -1.79956 with *t-statistic* of -25.48. (5.3b) quantifying the overall influence on Tobin's Q through the equation system. The change between time *t* and *t+1*, does not significantly increase for 'good' issuers while it significantly decreases by 1.902% for 'bad' issuers. Panel C of Table 5.10 shows the overall changes in Tobin's Q calculated according to (5.3b) are not significant due to the insignificant coefficients on rating dummies. The coefficient estimates on control variables in equation (5.4a) are consistent with those from the DCRC effect equation estimation in Chapter III.

Table 5.10 and 5.11 respectively presents the results of the two equation systems (5.5a) (5.5b) and (5.6a) (5.6b) when net debt issuance, the independent variable in the second equation, is broken down into debt issuance and equity issuance. Table 5.10 shows the changes in Tobin's Q due to the adjustments of debt issuance. Panel A of Table 5.10 shows that change in Tobin's Q is insignificant

with *t-statistic* of 0.50 one quarter before DCRC, suggesting that Tobin's Q does not change significantly in the quarter. Panel B of Table 5.10 indicates that 'good' issuers do not issue debt while 'bad' issuers increase debt issuance in the quarter of DCRC. However, the coefficient on debt issuance in (5.5b) is negatively significant at the 1% level. The system derived change in Tobin's Q for 'good' issuers is not significant but that for 'bad' issuers is significant at -0.00569. The results imply that 'good' issuers' Tobin's Q does not significantly decrease after the financing change while 'bad' issuers' Tobin's Q moderately decreases by 0.569%. The result in Panel C of Table 5.3 shows that the coefficient μ_1 on net debt issuance is 2.04430 and significant at 1%. The result implies that system derived change in Tobin's Q seems significantly converted from decrease to increase in the period one quarter after DCRC. 'Good' issuers do not gain benefit while 'bad' issuers improve Tobin's Q through increasing debt financing before DCRC.

[Insert Table 5.11 here]

Table 5.12 shows the changes in Tobin's Q due to the adjustments of equity financing. Panel A of Table 5.12 shows that μ_1 in the second equation demonstrates that Tobin's Q do not change significantly in the period. Panel B and Panel C of Table 5.12 show that only 'good' issuers increase equity issuance in the quarter of DCRC and one quarter after DCRC, yet, the significance levels of 5% and 10% respectively. μ_1 in the two panels indicating the changes in Tobin's Q due to equity issuance in the two periods, is significant for both at the 1% level. The summarized Tobin's Q changes in the two periods, reported in the last two rows in the panels, show that 'good' issuers gain improvements in Tobin's Q due to moderate equity

issuance before DCRC while 'bad' issuers do not gain benefit through equity issuance.

[Insert Table 5.12 here]

5.6.2 Three-equation System

To examine the robustness of the results from two-equation system, the three-equation system (5.7a)-(5.7c) is implemented. The last two rows of the three panels in Table 5.13 present the results of system derived changes in Tobin's Q for the three periods around DCRCs respectively. Panel A of Table 5.13 shows that the changes in Tobin's Q driven by financing adjustments before DCRC are not significant for 'good' and 'bad' issuers. This is determined by the insignificant coefficient estimates of change in Tobin's Q in (5.7c). Panel B of Table 5.13 shows that only 'bad' issuers increase their debt issuance before DCRC while neither of them significantly increase equity issuance in the quarter of DCRC. The coefficient on debt issuance in (5.7c) is statistically significantly positive at the 1% confidence level while that on equity issuance is not significant. As a result, the final changes in Tobin's Q for 'good' and 'bad' issuers are not significant. Panel C of Table 5.13 shows that the signs and significances of coefficients in (5.7a) and (5.7b) on debt and equity issuance are the same as those in Panel B. The coefficients on both debt and equity issuance in (5.7c) are significantly positive. The changes in Tobin's Q are mainly driven by debt issuance and are significant to both 'good' and 'bad' issuers at 0.01631 and 0.03599, yet at 10% and 1% confidence level respectively.

[Insert Table 5.13 here]

To summarise the results given by the two-equation system shown in Section 5.4, 5.5 and 5.6 employing ROA, EPS and Tobin's Q as firm performance measures, the evidence shows that 'good' issuers do not adjust financing before upgrades while 'bad' issuers increase debt issuance before downgrade. In addition, the coefficients on debt issuance in the benefit equation are significantly positive in the last two quarters when the firm performance measures are ROA and EPS while it is significantly negative when the firm performance measure is Tobin's Q. The coefficients on equity financing have opposite signs and significances for the three performance measures. The estimation results of the three-equation systems show that issuers only adopt debt financing in response to DCRCs. The coefficients in the benefits equation are positive on debt issuance but negative on equity issuance when firm performance measures are ROA and EPS. They are both significantly positive when the firm performance measure is Tobin's Q. The results indicate that changes in ROA and EPS are positively related to the debt issuances of 'bad' issuers and change in Tobin's Q improves due to the equity financing of 'good' issuers.

5.7 Effects of Long-term Debt and Short-term Debt Issuance

The previous sections have discussed the changes in firm performance measures due to debt issuance and equity issuance before DCRCs when anticipated next-quarter upgrades and downgrade are anticipated. This section discusses the changes in firm performance measures due to long-term debt financing $\Delta Ldet_{i,t}$ and short-term debt financing $\Delta Sdet_{i,t}$ which further decomposes the influences of debt financing. Estimates for the three-equation system are presented in Table 5.14, 5.15

and 5.16 corresponding to the firm performance measures: ROA, EPS and Tobin's Q.

[Insert Table 5.14 here]

Table 5.14 lists the estimated result for the three-equation system (5.9a), (5.9b) and (5.9c) when ROA is adopted as a firm performance measure. Panel A of Table 5.14 shows the results one quarter before DCRC. The insignificant estimates of β_1^L on $\Delta Ldet_{i,t}$ and β_1^S on $\Delta Sdet_{i,t}$ indicate the insignificant use of long-term debt and short-term financing for 'good' issuers. In contrast, the significantly positive estimates of β_1^L on $\Delta Ldet_{i,t}$ and β_1^S on $\Delta Sdet_{i,t}$ indicate the significant increase of long-term debt and short-term financing for 'bad' issuers before next-quarter downgrades. It is consistent with the prediction of debt financing for 'good' and 'bad' issuers that the former do not adjust debt issuance while the latter issue cheaper debt before downgrade. The insignificant estimates of μ_1^L and μ_1^S in (5.9c) imply that ROA does not significantly move in the quarter of financing adjustment. The system derived influences on ROA thus are not significant in this period.

Panel B of Table 5.14 shows the results in the quarter of DCRC. The signs and significances of coefficient estimates of rating dummies in (5.9a) and (5.9b) keep the same as those in the last quarter. However, μ_1^L and μ_1^S in (5.9c) are both significant in this quarter. μ_1^L is 1.76073 with a *t-statistic* of 30.26 while μ_1^S is -2.17103 with a *t-statistic* of -26.60. The result indicates that long-term debt financing is positively correlated with ROA improvement while short-term debt financing is negatively correlated with it. As a result, the systemised ROA improvement given by (5.10b) indicates that 'good' issuers' ROA is not

significantly driven by financing adjustment, while 'bad' issuers' ROA increases due to the increase of long-term debt financing, but decreases due to the usage of short-term financing. The results shown in Panel C of Table 5.14 indicate that ROA of 'bad' issuers continues to increase due to long-term debt increase one quarter after DCRC.

Table 5.15 shows a different phenomenon to that in Table 5.14. The estimation result in one quarter before DCRC is reported in Panel A of Table 5.15. Neither long-term debt nor short-term debt financing would benefit the improvement of EPS. In the quarter of DCRC, μ_1^L and μ_1^S reported in Panel B are both significant, however, their signs are opposite to those in Panel B of Table 5.14. μ_1^L is negatively significant at -13.4262 with a *t-statistic* of -2.68, while μ_1^S is positively significant at 27.46567 with a *t-statistic* of 3.89. As shown in the last two rows of this panel, EPS decreases due to 'bad' issuers' long-term debt financing and it increases due to 'bad' issuers' short-term financing. However, the increase of EPS due to short-term financing is temporary since the improvement of EPS is not significant though positive as shown in Panel C of Table 5.14. The EPS of 'good' issuers and 'bad' issuers slightly decrease due to long-term debt financing in the quarter after DCRC.

[Insert Table 5.15 here]

Table 5.16 presents changes in Tobin's Q due to long-term debt and short-term debt financing respectively. Panel A does not show significant changes in Tobin's Q due to financing adjustments. Panel B of Table 5.16 shows that the coefficient on long-term debt issuance is positive while that on short-term debt issuance is negative, which is consistent with the results reported in Table 5.14 on the changes

in ROA. The last two rows of Panel B show the results derived by (5.10b) that long-term debt financing increases Tobin's Q while short-term financing decreases Tobin's Q. The long-term debt financing effect lasts at least till the next quarter, one quarter after DCRC takes place.

[Insert Table 5.16 here]

5.8 Conclusions

This chapter examines issuers' benefits in adjusting financing prior to rating change taking place. This study assumes that both issuers and rating agencies are insiders, whose predictions on next-period rating announcements are the same as each other. They know firms' future rating changes earlier and more precisely than outsiders, specifically investors and other market participants. This study assumes that the rating announcements from agencies are delayed at least one period and thus create an information asymmetry window. Therefore, issuers are able to benefit themselves, particularly through the improvement of firm performance, by utilising their superior information. Issuers adjust their financing strategy before the real rating changes announced by raters in order to balance associated costs and benefits to improve their real financial status.

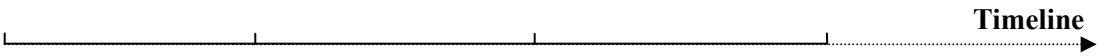
The data sample includes all non-missing observations from quarterly Compustat North data from Q1 1985 to Q4 2010 and the Standard & Poor's ratings data. The tests in this chapter focus on the nonfinancial firms. The overall result robustly supports the hypotheses that the information gap between issuers and outsiders driven by DCRCs contains value and affects issuers' financing strategy in many ways. Firstly, the evidence shows that firms adjust debt and equity issuances

one-period before rating changes, which is consistent with the results in the previous chapters. More specifically, 'good' issuers do not significantly adjust net debt issuance while 'bad' issuers significantly increase net debt issuance. Secondly, debt financing before DCRCs seem always to bring some temporary improvement in ROA and EPS. Yet, its influences on Tobin's Q transfer from negative to positive. Thirdly, equity financing generally does not bring significant improvement on ROA and EPS, but does improve on Tobin's Q. Fourth, long-term debt financing brings improvements on ROA and Tobin's Q and short-term debt brings negative changes on these two measures, while short-term debt bring positive changes in EPS for issuers.

The evidence shown in this chapter supports the hypotheses that financing adjustment before DCRC brings material benefits to firms who possess superior information on next-quarter rating changes. The combination of DCRC, the newly considered driving factor of asymmetric information, and its driven behaviour on issuers' financing adjustment enriches the explicit understanding of relations among DCRC, financing behaviour and firm performance.

Figure 5.1 The timeline of actions of issuers and market

The graph displays the timeline of the actions of issuers and market and thus indicates the transmission mechanism.



Time *t-1*	**Time *t***	**Time *t+1***	**Time *t+2***
No significant financing adjustment	**Debt-Equity financing adjustment**	**Rating change take place**	**Whether benefits gained from financing adjustment continue?**
Insiders may have private information about their firm perspectives.	Insiders start to adjust their financing by utilising their private information. 'Good' issuers and 'bad' issuers have significantly different financing preferences.	Issuers may gain Benefits	Test if issuers could still gain benefits from the financing plan adjustments at Time *t*.

Table 5. 1 Summary statistics

The sample is drawn from quarterly Compustat data, excluding financial firms and utility firms and firm-quarters with negative equity values during the period Q1 1985 - Q4 2010. The table lists summary statistics of dependant variables and control variables in the tests. Δdet is defined as long-term debt issuance minus long-term debt reduction plus changes in current debt and normalised by firms' total assets. Δeqt is defined as sale of common and preferred stock minus purchases of common and preferred stock and normalized by firm's total assets. Δnet is defined as Δdet minus Δeqt. Other control variable definitions are *Leverage*: ratio of the sum of short-term debt (*Sd*) and long-term debt (*Ld*) to the sum of short-term debt, long-term debt, and stockholders' equity. *Size:* logarithm of sales. *Price***:** logarithm of the close price of the quarter. *Liquidity*: ratio of cash and cash equivalent divided (normalised) by total assets. *Profit***:** ratio of *EBITDA* to total assets. *Dividends*: ratio of dividends to total assets. *Earnings***:** ratio of retained earnings to total assets. *Growth***:** total debt book value plus quarterly close price multiply outstanding common stock shares and normalised by total assets. *Tangibility*: ratio of property plant and equipment (Net) to total assets. *NDTS*: ratio of deferred taxes and investment tax credit to total assets. Panel B lists firm characteristics by financing types. The four types are defined as: *Debt only* financing firms are those with positiveΔdet but non-positive Δeqt; *Equity only* financing firms are those with positive Δeqt but non-positive Δdet; *Dual* financing means both Δdet and Δeqt are positive and *Internal* financing is assumed if no issuance is made, which means both Δdet and Δeqt are both non-positive. ΔROA is the change in ROA (Return on Assets), ΔEPS is the change in EPS (earnings per share) and $\Delta TobinQ$ is the change in Tobin's Q. Outliers are less than 1% of the overall observations. These observations or outliers are in the end of the time series of each firm's observations, which means no more observations are available after the observations containing extreme numbers. It indicates that the company could not 'survive' after it. Tests excluding outliers are conducted and the results show consistency with those of the full sample.

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	125,805	0.006	0.000	0.086	-1.414	11.164
Δeqt	229,674	0.014	0.000	0.161	-1.795	17.584
Δnet	114,970	-0.010	-0.002	0.200	-17.584	11.164
$\Delta Sdet$	134,263	0.002	0.000	0.049	-1.414	3.885
$\Delta Ldet$	230,587	0.005	0.000	0.088	-3.876	11.164
Leverage	114,970	0.226	0.160	0.240	0.000	1.000
Size	114,970	3.280	3.266	2.520	-6.908	11.730
Price	114,970	1.953	2.183	1.529	-7.419	11.523
Liquidity	114,970	0.197	0.102	0.225	-0.034	1.000
Profit	114,970	0.007	0.024	0.224	-59.926	13.207
Dividends	114,970	0.007	0.000	0.037	-0.012	3.700
Earnings	114,970	-0.653	0.141	9.344	-2624.430	2.337
Growth	114,970	1.957	1.167	8.760	0.001	2370.330
Tangibility	114,970	0.258	0.191	0.227	0.000	1.000
NDTS	114,970	0.018	0.000	0.033	-0.013	0.692
ROA	114,783	-0.013	0.009	0.137	-12.721	12.839
EPS	114,712	0.150	0.070	13.255	-3435.000	2087.000
ΔROA	114,793	-0.001	0.000	0.376	-93.410	59.637
ΔEPS	114,738	0.010	0.000	10.931	-1967.490	3113.000
$\Delta TobinQ$	114,354	-0.074	-0.004	9.045	-2258.463	172.637

Table 5. 2 ROA change in response to net debt issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.4a) and (5.4b) for non-financial firms. Y in (5.4b) is substituted as ROA in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta ROA_{i,t}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta ROA_{i,t+1}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta ROA_{i,t+2}$	
$Intercept$	-0.01045***	$Intercept$	-0.06685***	$Intercept$	-0.00545***	$Intercept$	-0.02811***	$Intercept$	-0.01143***	$Intercept$	-0.0226***
	(-6.01)		(-4.17)		(-3.16)		(-23.49)		(-3.91)		(-19.74)
$OR^{U}{}_{i,t+1}$	0.00307	$\Delta net_{i,t}$	-2.34561	$OR^{U}{}_{i,t+1}$	-0.00100	$\Delta net_{i,t}$	0.019103***	$OR^{U}{}_{i,t+1}$	-0.00292	$\Delta net_{i,t}$	0.076068***
	(0.75)		(-1.64)		(-0.14)		(4.54)		(-0.25)		(15.33)
$OR^{D}{}_{i,t+1}$	0.01148**			$OR^{D}{}_{i,t+1}$	0.01250***			$OR^{D}{}_{i,t+1}$	0.003152		
	(2.14)				(2.31)				(0.34)		
$Leverage_{i,t-1}$	-0.02734***	$Leverage_{i,t-1}$	-0.08462**	$Leverage_{i,t-1}$	-0.02606***	$Leverage_{i,t}$	-0.02427***	$Leverage_{i,t-1}$	-0.03671***	$Leverage_{i,t+1}$	-0.01623***
	(-9.71)		(-2.15)		(-9.38)		(-12.66)		(-7.73)		(-8.90)
$Size_{i,t-1}$	0.008675***	$Size_{i,t-1}$	0.029957***	$Size_{i,t-1}$	0.00833***	$Size_{i,t}$	0.00782***	$Size_{i,t-1}$	0.010205***	$Size_{i,t+1}$	0.005326***
	(24.32)		(2.39)		(23.36)		(31.44)		(16.81)		(22.14)
$Price_{i,t-1}$	-0.00703***	$Price_{i,t-1}$	-0.00753	$Price_{i,t-1}$	-0.00916***	$Price_{i,t}$	0.006909***	$Price_{i,t-1}$	-0.00871***	$Price_{i,t+1}$	0.007569***
	(-12.84)		(-0.74)		(-16.74)		(18.30)		(-9.33)		(20.66)
$Liquidity_{i,t-1}$	-0.01814***	$Liquidity_{i,t-1}$	-0.0592**	$Liquidity_{i,t-1}$	-0.00783***	$Liquidity_{i,t}$	-0.01513***	$Liquidity_{i,t-1}$	-0.02635***	$Liquidity_{i,t+1}$	-0.00965***
	(-5.58)		(-2.17)		(-2.43)		(-6.67)		(-4.81)		(-4.42)
$Profit_{i,t-1}$	0.19182***	$Profit_{i,t-1}$	-0.46448*	$Profit_{i,t-1}$	0.16773***	$Profit_{i,t}$	-0.93331***	$Profit_{i,t-1}$	0.201523***	$Profit_{i,t+1}$	-0.80466***
	(71.63)		(-1.69)		(60.38)		(-718.34)		(45.15)		(-247.03)
$Dividends_{i,t-1}$	0.004244	$Dividends_{i,t-1}$	0.049212	$Dividends_{i,t-1}$	0.012849	$Dividends_{i,t}$	0.203035***	$Dividends_{i,t-1}$	0.019192	$Dividends_{i,t+1}$	0.117409***
	(0.35)		(1.41)		(1.08)		(12.72)		(0.97)		(8.60)
$Earnings_{i,t-1}$	0.00108***	$Earnings_{i,t-1}$	0.003289**	$Earnings_{i,t-1}$	0.004785***	$Earnings_{i,t}$	0.00459***	$Earnings_{i,t-1}$	0.003223***	$Earnings_{i,t+1}$	0.002864***
	(16.22)		(2.12)		(28.48)		(41.18)		(15.69)		(26.30)
$Growth_{i,t-1}$	-0.00188***	$Growth_{i,t-1}$	-0.00415	$Growth_{i,t-1}$	-0.00154***	$Growth_{i,t}$	0.00015***	$Growth_{i,t-1}$	-0.00137***	$Growth_{i,t+1}$	-0.00063***
	(-27.31)		(-1.54)		(-23.00)		(3.13)		(-12.16)		(-5.69)
$Tangibility_{i,t-1}$	-0.0075***	$Tangibility_{i,t-1}$	0.01416	$Tangibility_{i,t-1}$	-0.00893***	$Tangibility_{i,t}$	0.02311***	$Tangibility_{i,t-1}$	-0.00612	$Tangibility_{i,t+1}$	0.021576***
	(-2.49)		(1.04)		(-3.01)		(11.25)		(-1.21)		(11.07)
$NDTS_{i,t-1}$	0.03003	$NDTS_{i,t-1}$	0.010621	$NDTS_{i,t-1}$	0.039247**	$NDTS_{i,t}$	-0.02670*	$NDTS_{i,t-1}$	0.043658	$NDTS_{i,t+1}$	-0.03567***
	(1.51)		(0.15)		(2.00)		(-1.95)		(1.31)		(-2.76)
Adj R-square	0.2159			Adj R-square	0.7124			Adj R-square	0.2423		
N	229,561			N	218,085			N	206,583		
$\Delta Y_{i,t} \mid OR^{U}_{i,t+1}$	-0.0072			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	-0.00002			$\Delta Y_{i,t+2} \mid OR^{U}_{i,t+1}$	-0.00022		
$\Delta Y_{i,t} \mid OR^{D}_{i,t+1}$	-0.02693			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	0.000239***			$\Delta Y_{i,t+2} \mid OR^{D}_{i,t+1}$	0.00024		

Table 5. 3 ROA change in response to debt issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.5a) and (5.5b) for non-financial firms. Y in (5.5b) is substituted as ROA in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta ROA_{i,t}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta ROA_{i,t+1}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta ROA_{i,t+2}$	
$Intercept$	0.01157***	$Intercept$	-0.02556***	$Intercept$	0.01069***	$Intercept$	-0.03011***	$Intercept$	0.01118***	$Intercept$	-0.01699***
	(15.55)		(-4.10)		(13.78)		(-26.22)		(11.11)		(-6.11)
$OR^{U}{}_{i,t+1}$	0.00581**	$\Delta det_{i,t}$	-1.57012***	$OR^{U}{}_{i,t+1}$	0.00398	$\Delta det_{i,t}$	0.12893***	$OR^{U}{}_{i,t+1}$	0.00614	$\Delta det_{i,t}$	-0.00186
	(2.12)		(-3.20)		(1.27)		(15.77)		(1.50)		(-0.06)
$OR^{D}{}_{i,t+1}$	0.01798***			$OR^{D}{}_{i,t+1}$	0.01812***			$OR^{D}{}_{i,t+1}$	0.01544***		
	(7.74)				(7.42)				(4.85)		
$Leverage_{i,t-1}$	-0.01634***	$Leverage_{i,t-1}$	-0.04700***	$Leverage_{i,t-1}$	-0.01685***	$Leverage_{i,t}$	-0.02651***	$Leverage_{i,t-1}$	-0.01462***	$Leverage_{i,t+1}$	-0.00837*
	(-13.57)		(-5.22)		(-13.50)		(-14.01)		(-8.95)		(-1.80)
$Size_{i,t-1}$	-0.00169***	$Size_{i,t-1}$	0.00727***	$Size_{i,t-1}$	-0.00173***	$Size_{i,t}$	0.008607***	$Size_{i,t-1}$	-0.00163***	$Size_{i,t+1}$	0.00650***
	(-11.21)		(7.41)		(-10.92)		(36.39)		(-7.89)		(11.22)
$Price_{i,t-1}$	0.00257***	$Price_{i,t-1}$	0.01294***	$Price_{i,t-1}$	0.00293***	$Price_{i,t}$	0.00635***	$Price_{i,t-1}$	0.00253***	$Price_{i,t+1}$	0.00044
	(10.97)		(8.34)		(11.92)		(17.46)		(7.86)		(0.50)
$Liquidity_{i,t-1}$	-0.01857***	$Liquidity_{i,t-1}$	-0.05134***	$Liquidity_{i,t-1}$	-0.02039***	$Liquidity_{i,t}$	-0.02019***	$Liquidity_{i,t-1}$	-0.02031***	$Liquidity_{i,t+1}$	0.02414***
	(-13.61)		(-4.92)		(-14.33)		(-9.55)		(-10.99)		(4.74)
$Profit_{i,t-1}$	-0.00279***	$Profit_{i,t-1}$	-0.90931***	$Profit_{i,t-1}$	0.00372***	$Profit_{i,t}$	-0.92938***	$Profit_{i,t-1}$	0.00045	$Profit_{i,t+1}$	-0.86371***
	(-2.37)		(-189.88)		(2.91)		(-721.26)		(0.28)		(-110.04)
$Dividends_{i,t-1}$	-0.00001	$Dividends_{i,t-1}$	0.04180**	$Dividends_{i,t-1}$	-0.00062	$Dividends_{i,t}$	0.1821***	$Dividends_{i,t-1}$	-0.00026	$Dividends_{i,t+1}$	0.16694***
	(0.00)		(2.07)		(-0.12)		(12.62)		(-0.04)		(5.23)
$Earnings_{i,t-1}$	-0.00015***	$Earnings_{i,t-1}$	0.00065***	$Earnings_{i,t-1}$	-0.00093***	$Earnings_{i,t}$	0.004938***	$Earnings_{i,t-1}$	-0.00024***	$Earnings_{i,t+1}$	0.01451***
	(-5.29)		(4.77)		(-12.70)		(47.73)		(-3.42)		(57.58)
$Growth_{i,t-1}$	0.00008***	$Growth_{i,t-1}$	0.00041***	$Growth_{i,t-1}$	0.00006**	$Growth_{i,t}$	0.0001**	$Growth_{i,t-1}$	0.00004	$Growth_{i,t+1}$	-0.00033
	(2.76)		(3.28)		(2.04)		(2.08)		(0.95)		(-1.23)
$Tangibility_{i,t-1}$	0.00735***	$Tangibility_{i,t-1}$	0.04356***	$Tangibility_{i,t-1}$	0.00752***	$Tangibility_{i,t}$	0.02396***	$Tangibility_{i,t-1}$	0.00465***	$Tangibility_{i,t+1}$	0.02387***
	(5.67)		(6.96)		(5.61)		(12.10)		(2.65)		(5.02)
$NDTS_{i,t-1}$	-0.02594***	$NDTS_{i,t-1}$	-0.10334***	$NDTS_{i,t-1}$	-0.02583***	$NDTS_{i,t}$	-0.03617***	$NDTS_{i,t-1}$	-0.0075	$NDTS_{i,t+1}$	-0.03679
	(-3.04)		(-2.92)		(-2.92)		(-2.75)		(-0.65)		(-1.16)
Adj R-square	0.1542			Adj R-square	0.6913			Adj R-square	0.0571		
N	251,215			N	238,243			N	226,063		
$\Delta Y_{i,t} \mid OR^{U}_{i,t+1}$	-0.00912**			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	0.00051			$\Delta Y_{i,t+2} \mid OR^{U}_{i,t+1}$	-0.00001		
$\Delta Y_{i,t} \mid OR^{D}_{i,t+1}$	-0.02822***			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	0.00234***			$\Delta Y_{i,t+2} \mid OR^{D}_{i,t+1}$	-0.00003		

Table 5. 4 ROA change in response to equity issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.6a) and (5.6b) for non-financial firms. Y in (5.6b) is substituted as ROA in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. OR^U and OR^D are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta ROA_{i,t}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta ROA_{i,t+1}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta ROA_{i,t+2}$	
$Intercept$	0.01851***	$Intercept$	0.00596	$Intercept$	0.01365***	$Intercept$	-0.02353***	$Intercept$	0.01791***	$Intercept$	-0.02035***
	(17.98)		(0.38)		(13.50)		(-26.68)		(11.96)		(-22.80)
$OR^U{}_{i,t+1}$	0.00526*	$\Delta eqt_{i,t}$	-2.17386***	$OR^U{}_{i,t+1}$	0.00728**	$\Delta eqt_{i,t}$	-0.00663	$OR^U{}_{i,t+1}$	0.01062***	$\Delta eqt_{i,t}$	-0.12144***
	(1.71)		(-2.58)		(2.10)		(-1.61)		(2.08)		(-23.47)
$OR^D{}_{i,t+1}$	0.00948***			$OR^D{}_{i,t+1}$	0.00408			$OR^D{}_{i,t+1}$	0.00847**		
	(4.36)				(1.45)				(2.02)		
$Leverage_{i,t-1}$	0.01431***	$Leverage_{i,t-1}$	0.015521	$Leverage_{i,t-1}$	0.01037***	$Leverage_{i,t}$	-0.01894***	$Leverage_{i,t-1}$	0.01963***	$Leverage_{i,t+1}$	-0.01050***
	(9.22)		(1.19)		(6.84)		(-14.42)		(8.69)		(-7.90)
$Size_{i,t-1}$	-0.00966***	$Size_{i,t-1}$	-0.01303	$Size_{i,t-1}$	-0.00918***	$Size_{i,t}$	0.00676***	$Size_{i,t-1}$	-0.01055***	$Size_{i,t+1}$	0.00364***
	(-45.63)		(-1.61)		(-43.89)		(36.41)		(-33.91)		(19.07)
$Price_{i,t-1}$	0.00845***	$Price_{i,t-1}$	0.02720***	$Price_{i,t-1}$	0.01096***	$Price_{i,t}$	0.00723***	$Price_{i,t-1}$	0.01059***	$Price_{i,t+1}$	0.01018***
	(26.36)		(3.80)		(34.58)		(26.20)		(22.43)		(36.34)
$Liquidity_{i,t-1}$	0.00742***	$Liquidity_{i,t-1}$	-0.01339	$Liquidity_{i,t-1}$	-0.00600***	$Liquidity_{i,t}$	-0.02415***	$Liquidity_{i,t-1}$	0.01122***	$Liquidity_{i,t+1}$	-0.02149***
	(3.72)		(-1.61)		(-3.06)		(-13.74)		(3.86)		(-11.96)
$Profit_{i,t-1}$	-0.15957***	$Profit_{i,t-1}$	-1.23513***	$Profit_{i,t-1}$	-0.15997***	$Profit_{i,t}$	-0.91515***	$Profit_{i,t-1}$	-0.19292***	$Profit_{i,t+1}$	-0.73809***
	(-81.96)		(-9.18)		(-79.19)		(-732.9)		(-67.2)		(-266.82)
$Dividends_{i,t-1}$	-0.00357	$Dividends_{i,t-1}$	0.03355	$Dividends_{i,t-1}$	-0.01167	$Dividends_{i,t}$	0.14019***	$Dividends_{i,t-1}$	-0.01500***	$Dividends_{i,t+1}$	0.09903***
	(-0.39)		(1.38)		(-1.31)		(11.42)		(-1.15)		(8.00)
$Earnings_{i,t-1}$	-0.00157***	$Earnings_{i,t-1}$	-0.00235*	$Earnings_{i,t-1}$	-0.00575***	$Earnings_{i,t}$	0.00475***	$Earnings_{i,t-1}$	-0.00412***	$Earnings_{i,t+1}$	-0.00077***
	(-30.59)		(-1.76)		(-52.14)		(50.95)		(-32.30)		(-18.12)
$Growth_{i,t-1}$	0.00300***	$Growth_{i,t-1}$	0.00666***	$Growth_{i,t-1}$	0.00242***	$Growth_{i,t}$	-0.00011***	$Growth_{i,t-1}$	0.00212***	$Growth_{i,t+1}$	-0.00161***
	(56.36)		(2.64)		(47.01)		(-2.40)		(28.17)		(-16.15)
$Tangibility_{i,t-1}$	0.01009***	$Tangibility_{i,t-1}$	0.04611***	$Tangibility_{i,t-1}$	0.01166***	$Tangibility_{i,t}$	0.018211**	$Tangibility_{i,t-1}$	0.00804***	$Tangibility_{i,t+1}$	0.01744***
	(6.29)		(4.81)		(7.48)		(13.41)		(3.46)		(12.73)
$NDTS_{i,t-1}$	-0.03145***	$NDTS_{i,t-1}$	-0.11634***	$NDTS_{i,t-1}$	-0.04044***	$NDTS_{i,t}$	-0.03129***	$NDTS_{i,t-1}$	-0.02601*	$NDTS_{i,t+1}$	-0.04653***
	(-2.94)		(-3.02)		(-3.87)		(-3.42)		(-1.68)		(-5.06)
Adj R-square	0.0702			Adj R-square	0.5689			Adj R-square	0.1704		
N	458,657			N	436,293			N	413,041		
$\Delta Y_{i,t} \mid OR^U_{i,t+1}$	-0.01143*			$\Delta Y_{i,t+1} \mid OR^U_{i,t+1}$	-0.00005			$\Delta Y_{i,t+2} \mid OR^U_{i,t+1}$	-0.00129**		
$\Delta Y_{i,t} \mid OR^D_{i,t+1}$	-0.02061***			$\Delta Y_{i,t+1} \mid OR^D_{i,t+1}$	-0.00003			$\Delta Y_{i,t+2} \mid OR^D_{i,t+1}$	-0.00103**		

Table 5. 5 Changes in ROA due to debt and equity issuance

Values of estimated coefficients and their *t-statistic* for Equation (5.7a) (5.7b) and (5.7c) for non-financial firms. Y in (5.7c) is substituted as ROA. Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take places at quarter *t+1*. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$ is change in ROA due to adjustment in debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$ is change in ROA due to adjustment in debt financing when downgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$ is change in ROA due to adjustment in equity financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$ is change in ROA due to adjustment in equity financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A (τ = 0) **Before the quarter of DCRC**					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta ROA_{i,t}$	
Intercept	0.01173***	*Intercept*	-0.01359	*Intercept*	-0.01359
	(15.06)		(-0.36)		(-0.36)
$OR^{U}{}_{i,t+1}$	0.00626**	$OR^{U}{}_{i,t+1}$	-1.33344	$\Delta det_{i,t}$	-1.33344
	(2.01)		(-1.17)		(-1.17)
$OR^{D}{}_{i,t+1}$	0.01774***	$OR^{D}{}_{i,t+1}$	-0.59279	$\Delta eqt_{i,t}$	-0.59279
	(7.29)		(-0.27)		(-0.27)
$Leverage_{i,t-1}$	-0.01651***	$Leverage_{i,t-1}$	-0.03601	$Leverage_{i,t-1}$	-0.03601
	(-13.07)		(-0.87)		(-0.87)
$Size_{i,t-1}$	-0.00168***	$Size_{i,t-1}$	0.00124	$Size_{i,t-1}$	0.00124
	(-10.51)		(0.06)		(0.06)
$Price_{i,t-1}$	0.00256***	$Price_{i,t-1}$	0.01805	$Price_{i,t-1}$	0.01805
	(10.42)		(0.98)		(0.98)
$Liquidity_{i,t-1}$	-0.01889***	$Liquidity_{i,t-1}$	-0.00082	$Liquidity_{i,t-1}$	-0.04226**
	(-12.96)		(-0.28)		(-2.03)
$Profit_{i,t-1}$	-0.00247**	$Profit_{i,t-1}$	-0.19428***	$Profit_{i,t-1}$	-1.03290***
	(-2.06)		(-81.57)		(-2.46)
$Dividends_{i,t-1}$	-0.00029	$Dividends_{i,t-1}$	-0.00453	$Dividends_{i,t-1}$	0.03617
	(-0.05)		(-0.42)		(1.51)
$Earnings_{i,t-1}$	-0.00016***	$Earnings_{i,t-1}$	-0.00124***	$Earnings_{i,t-1}$	-0.00019
	(-5.39)		(-20.94)		(-0.07)
$Growth_{i,t-1}$	0.00008***	$Growth_{i,t-1}$	0.00196***	$Growth_{i,t-1}$	0.00153
	(2.59)		(32.01)		(0.37)
$Tangibility_{i,t-1}$	0.00688***	$Tangibility_{i,t-1}$	0.01434***	$Tangibility_{i,t-1}$	0.04948*
	(5.09)		(5.35)		(1.96)
$NDTS_{i,t-1}$	-0.02624***	$NDTS_{i,t-1}$	-0.05635***	$NDTS_{i,t-1}$	-0.12812
	(-2.95)		(-3.19)		(-1.23)
Adj R-square			0.1156		
N			344,340		
$\Delta Y_{i,t}|OR^{U}_{i,t+1}$	0.78210	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$	-0.00835	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$	0.79045
$\Delta Y_{i,t}|OR^{D}_{i,t+1}$	0.32774	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$	-0.02366	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$	0.35140

Table 5.5 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta ROA_{i,t+1}$	
Intercept	0.01073***	*Intercept*	0.01619***	*Intercept*	-0.02910***
	(13.18)		(10.72)		(-24.28)
$OR^U{}_{i,t+1}$	0.00491	$OR^U{}_{i,t+1}$	0.00588	$\Delta det_{i,t}$	0.11698***
	(1.50)		(0.96)		(13.66)
$OR^D{}_{i,t+1}$	0.01781***	$OR^D{}_{i,t+1}$	0.00523	$\Delta eqt_{i,t}$	0.00443
	(6.98)		(1.10)		(0.89)
$Leverage_{i,t-1}$	-0.01719***	$Leverage_{i,t-1}$	0.00886***	$Leverage_{i,t}$	-0.02556***
	(-13.12)		(3.64)		(-12.90)
$Size_{i,t-1}$	-0.00169***	$Size_{i,t-1}$	-0.01002***	$Size_{i,t}$	0.00829***
	(-10.03)		(-32.09)		(32.59)
$Price_{i,t-1}$	0.00298***	$Price_{i,t-1}$	0.01212***	$Price_{i,t}$	0.00636***
	(11.53)		(25.32)		(16.70)
$Liquidity_{i,t-1}$	-0.02103***	$Liquidity_{i,t-1}$	-0.01324***	$Liquidity_{i,t}$	-0.01432***
	(-13.82)		(-4.69)		(-6.25)
$Profit_{i,t-1}$	0.00438***	$Profit_{i,t-1}$	-0.16317***	$Profit_{i,t}$	-0.93316***
	(3.34)		(-67.11)		(-717.84)
$Dividends_{i,t-1}$	-0.00121	$Dividends_{i,t-1}$	-0.01395	$Dividends_{i,t}$	0.20490***
	(-0.22)		(-1.34)		(12.83)
$Earnings_{i,t-1}$	-0.00108***	$Earnings_{i,t-1}$	-0.00586***	$Earnings_{i,t}$	0.00478***
	(-13.57)		(-39.87)		(42.82)
$Growth_{i,t-1}$	0.00005	$Growth_{i,t-1}$	0.00160***	$Growth_{i,t}$	0.00014***
	(1.64)		(27.17)		(2.83)
$Tangibility_{i,t-1}$	0.00706***	$Tangibility_{i,t-1}$	0.01600***	$Tangibility_{i,t}$	0.02254***
	(5.05)		(6.17)		(10.96)
$NDTS_{i,t-1}$	-0.02654***	$NDTS_{i,t-1}$	-0.06587***	$NDTS_{i,t}$	-0.02303*
	(-2.87)		(-3.84)		(-1.68)
Adj R-square			0.6254		
N			327,126		
$\Delta Y_{i,t+1} \mid OR^U_{i,t+1}$	0.00060	$\Delta Y_{i,t+1} \mid (\Delta det_{i,t} \mid OR^U_{i,t+1})$	0.00057	$\Delta Y_{i,t+1} \mid (\Delta eqt_{i,t} \mid OR^U_{i,t+1})$	0.00003
$\Delta Y_{i,t+1} \mid OR^D_{i,t+1}$	0.00211***	$\Delta Y_{i,t+1} \mid (\Delta det_{i,t} \mid OR^D_{i,t+1})$	0.00208***	$\Delta Y_{i,t+1} \mid (\Delta eqt_{i,t} \mid OR^D_{i,t+1})$	0.00002

Table 5.5 *(continued)*

Panel C (τ = 2) **One quarter after DCRC**					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta ROA_{i,t+2}$	
Intercept	0.01186***	*Intercept*	0.02340***	*Intercept*	-0.02277***
	(11.13)		(9.34)		(-19.88)
$OR^U{}_{i,t+1}$	0.00685	$OR^U{}_{i,t+1}$	0.00986	$\Delta det_{i,t}$	0.11321***
	(1.58)		(0.97)		(8.13)
$OR^D{}_{i,t+1}$	0.01512***	$OR^D{}_{i,t+1}$	0.01212	$\Delta eqt_{i,t}$	-0.06964***
	(4.51)		(1.54)		(-12.23)
$Leverage_{i,t-1}$	-0.01472***	$Leverage_{i,t-1}$	0.02154***	$Leverage_{i,t+1}$	-0.01737***
	(-8.49)		(5.29)		(-8.99)
$Size_{i,t-1}$	-0.00160***	$Size_{i,t-1}$	-0.01180***	$Size_{i,t+1}$	0.00545***
	(-7.22)		(-22.68)		(22.27)
$Price_{i,t-1}$	0.00233***	$Price_{i,t-1}$	0.01105***	$Price_{i,t+1}$	0.00745***
	(6.84)		(13.82)		(20.2)
$Liquidity_{i,t-1}$	-0.02167***	$Liquidity_{i,t-1}$	0.00437	$Liquidity_{i,t+1}$	-0.00981***
	(-10.84)		(0.93)		(-4.46)
$Profit_{i,t-1}$	0.00216	$Profit_{i,t-1}$	-0.19972***	$Profit_{i,t+1}$	-0.80433***
	(1.32)		(-52.14)		(-246.29)
$Dividends_{i,t-1}$	0.00129	$Dividends_{i,t-1}$	-0.01789	$Dividends_{i,t+1}$	0.11766***
	(0.18)		(-1.05)		(8.62)
$Earnings_{i,t-1}$	-0.00028***	$Earnings_{i,t-1}$	-0.00352***	$Earnings_{i,t+1}$	0.00288***
	(-3.79)		(-19.95)		(26.46)
$Growth_{i,t-1}$	0.00005	$Growth_{i,t-1}$	0.00143***	$Growth_{i,t+1}$	-0.00065***
	(1.23)		(14.74)		(-5.82)
$Tangibility_{i,t-1}$	0.00417***	$Tangibility_{i,t-1}$	0.01036***	$Tangibility_{i,t+1}$	0.02158***
	(2.26)		(2.39)		(11.07)
$NDTS_{i,t-1}$	-0.00824	$NDTS_{i,t-1}$	-0.05195*	$NDTS_{i,t+1}$	-0.03502***
	(-0.68)		(-1.82)		(-2.71)
Adj R-square			0.1816		
N			309,873		
$\Delta Y_{i,t+2} \mid OR^U_{i,t+1}$	0.00009	$\Delta Y_{i,t+2} \mid (\Delta det_{i,t} \mid OR^U_{i,t+1})$	0.00078	$\Delta Y_{i,t+2} \mid (\Delta eqt_{i,t} \mid OR^U_{i,t+1})$	-0.00069
$\Delta Y_{i,t+2} \mid OR^D_{i,t+1}$	0.00087	$\Delta Y_{i,t+2} \mid (\Delta det_{i,t} \mid OR^D_{i,t+1})$	0.00171***	$\Delta Y_{i,t+2} \mid (\Delta eqt_{i,t} \mid OR^D_{i,t+1})$	-0.00084

Table 5. 6 EPS change in response to net debt issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.4a) and (5.4b) for non-financial firms. Y in (5.4b) is substituted as EPS in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta EPS_{i,t}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta EPS_{i,t+1}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta EPS_{i,t+2}$	
$Intercept$	-0.01047***	$Intercept$	-0.24376	$Intercept$	-0.00541***	$Intercept$	0.12859	$Intercept$	-0.01310***	$Intercept$	0.11567
	(-6.03)		(-0.75)		(-3.13)		(1.14)		(-4.47)		(0.96)
$OR^{U}{}_{i,t+1}$	-0.00320	$\Delta net_{i,t}$	-16.75150	$OR^{U}{}_{i,t+1}$	-0.00094	$\Delta net_{i,t}$	1.44935***	$OR^{U}{}_{i,t+1}$	-0.00071	$\Delta net_{i,t}$	1.45493***
	(-0.48)		(-0.58)		(-0.13)		(3.66)		(-0.06)		(2.78)
$OR^{D}{}_{i,t+1}$	0.01079**			$OR^{D}{}_{i,t+1}$	0.01245***			$OR^{D}{}_{i,t+1}$	0.00873		
	(1.99)				(2.29)				(0.94)		
$Leverage_{i,t-1}$	-0.02727***	$Leverage_{i,t-1}$	-0.29670	$Leverage_{i,t-1}$	-0.02611***	$Leverage_{i,t}$	-0.18138	$Leverage_{i,t-1}$	-0.03522***	$Leverage_{i,t+1}$	-0.22837
	(-9.68)		(-0.37)		(-9.40)		(-1.000)		(-7.40)		(-1.19)
$Size_{i,t-1}$	0.00870***	$Size_{i,t-1}$	0.132772	$Size_{i,t-1}$	0.00834***	$Size_{i,t}$	0.02233	$Size_{i,t-1}$	0.00998***	$Size_{i,t+1}$	0.06165
	(24.36)		(0.52)		(23.37)		(0.95)		(16.40)		(0.30)
$Price_{i,t-1}$	-0.00704***	$Price_{i,t-1}$	-0.05836	$Price_{i,t-1}$	-0.00916***	$Price_{i,t}$	-0.12112***	$Price_{i,t-1}$	-0.00789***	$Price_{i,t+1}$	0.03544
	(-12.86)		(-0.28)		(-16.74)		(-3.41)		(-8.43)		(1.40)
$Liquidity_{i,t-1}$	-0.01810***	$Liquidity_{i,t-1}$	-0.33834	$Liquidity_{i,t-1}$	-0.00789***	$Liquidity_{i,t}$	0.13444	$Liquidity_{i,t-1}$	-0.02302***	$Liquidity_{i,t+1}$	-0.13002
	(-5.57)		(-0.61)		(-2.44)		(0.63)		(-4.19)		(-3.37)
$Profit_{i,t-1}$	0.19181***	$Profit_{i,t-1}$	2.61758	$Profit_{i,t-1}$	0.16751***	$Profit_{i,t}$	-0.19579	$Profit_{i,t-1}$	0.19560***	$Profit_{i,t+1}$	0.11187
	(71.67)		(0.47)		(60.30)		(-1.60)		(43.61)		(0.49)
$Dividends_{i,t-1}$	0.00423	$Dividends_{i,t-1}$	0.09987	$Dividends_{i,t-1}$	0.01279	$Dividends_{i,t}$	0.52320	$Dividends_{i,t-1}$	0.00976	$Dividends_{i,t+1}$	-1.33536***
	(0.35)		(0.14)		(1.08)		(0.35)		(0.49)		(-3.87)
$Earnings_{i,t-1}$	0.00108***	$Earnings_{i,t-1}$	0.01787	$Earnings_{i,t-1}$	0.00479***	$Earnings_{i,t}$	0.00667	$Earnings_{i,t-1}$	0.00324***	$Earnings_{i,t+1}$	0.64659
	(16.22)		(0.57)		(28.50)		(0.64)		(15.67)		(0.45)
$Growth_{i,t-1}$	-0.00188***	$Growth_{i,t-1}$	-0.03588	$Growth_{i,t-1}$	-0.00154***	$Growth_{i,t}$	0.00282	$Growth_{i,t-1}$	-0.00142***	$Growth_{i,t+1}$	0.01529
	(-27.31)		(-0.66)		(-23.00)		(0.62)		(-12.48)		(1.33)
$Tangibility_{i,t-1}$	-0.00748***	$Tangibility_{i,t-1}$	-0.04237	$Tangibility_{i,t-1}$	-0.00898***	$Tangibility_{i,t}$	0.05836	$Tangibility_{i,t-1}$	-0.00685	$Tangibility_{i,t+1}$	0.01199
	(-2.48)		(-0.15)		(-3.03)		(0.3)		(-1.35)		(1.02)
$NDTS_{i,t-1}$	0.02886	$NDTS_{i,t-1}$	-1.35224	$NDTS_{i,t-1}$	0.039309	$NDTS_{i,t}$	-0.45454	$NDTS_{i,t-1}$	0.04905	$NDTS_{i,t+1}$	-0.36385
	(1.45)		(-0.93)		(2.01)		(-0.35)		(1.47)		(-0.27)
Adj R-square	0.0447			Adj R-square	0.0461			Adj R-square	0.0211		
N	229,451			N	217,967			N	206,475		
$\Delta Y_{i,t} \mid OR^{U}_{i,+1t}$	0.05361			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	-0.00136			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	-0.00103		
$\Delta Y_{i,t} \mid OR^{D}_{i,t+1}$	-0.18075			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	0.01805***			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	0.01270		

Table 5. 7 EPS change in response to debt issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.5a) and (5.5b) for non-financial firms. Y in (5.5b) is substituted as EPS in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^U{}_{i,t+1}$ and $OR^U{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta EPS_{i,t}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta EPS_{i,t+1}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta EPS_{i,t+2}$	
Intercept	0.01158***	*Intercept*	0.058145	*Intercept*	0.01062***	*Intercept*	0.087789	*Intercept*	0.01117***	*Intercept*	0.05746
	(15.6)		(0.29)		(13.69)		(0.85)		(11.10)		(0.52)
$OR^U{}_{i,t+1}$	0.00409	$\Delta det_{i,t}$	-11.395	$OR^U{}_{i,t+1}$	0.00428	$\Delta det_{i,t}$	3.58581***	$OR^U{}_{i,t+1}$	0.00618	$\Delta det_{i,t}$	4.84861***
	(1.38)		(-0.73)		(1.37)		(4.87)		(1.51)		(3.67)
$OR^D{}_{i,t+1}$	0.01812***			$OR^D{}_{i,t+1}$	0.01898***			$OR^D{}_{i,t+1}$	0.015584***		
	(7.78)				(7.75)				(4.88)		
$Leverage_{i,t-1}$	-0.01627***	$Leverage_{i,t-1}$	-0.02737	$Leverage_{i,t-1}$	-0.01682***	$Leverage_{i,t}$	-0.24105	$Leverage_{i,t-1}$	-0.01471***	$Leverage_{i,t+1}$	-0.31282*
	(-13.53)		(-0.10)		(-13.49)		(-1.41)		(-9.00)		(-1.69)
$Size_{i,t-1}$	-0.00170***	$Size_{i,t-1}$	-0.03097	$Size_{i,t-1}$	-0.00174***	$Size_{i,t}$	0.04083*	$Size_{i,t-1}$	-0.00162***	$Size_{i,t+1}$	0.05603***
	(-11.25)		(-1.00)		(-11.00)		(1.92)		(-7.82)		(2.43)
$Price_{i,t-1}$	0.00256***	$Price_{i,t-1}$	0.086626	$Price_{i,t-1}$	0.00300***	$Price_{i,t}$	-0.13146***	$Price_{i,t-1}$	0.00250***	$Price_{i,t+1}$	-0.13483***
	(10.95)		(1.77)		(12.20)		(-4.02)		(7.78)		(-3.79)
$Liquidity_{i,t-1}$	-0.01859***	$Liquidity_{i,t-1}$	-0.24345	$Liquidity_{i,t-1}$	-0.02026***	$Liquidity_{i,t}$	0.10112	$Liquidity_{i,t-1}$	-0.02025***	$Liquidity_{i,t+1}$	0.07665
	(-13.65)		(-0.74)		(-14.25)		(0.53)		(-10.95)		(0.38)
$Profit_{i,t-1}$	-0.00276***	$Profit_{i,t-1}$	-0.65626***	$Profit_{i,t-1}$	0.00185	$Profit_{i,t}$	-0.21390*	$Profit_{i,t-1}$	0.000465	$Profit_{i,t+1}$	-1.42735
	(-2.35)		(-4.35)		(1.44)		(-1.84)		(0.29)		(-4.58)
$Dividends_{i,t-1}$	0.00006	$Dividends_{i,t-1}$	0.04333	$Dividends_{i,t-1}$	-0.00159	$Dividends_{i,t}$	0.52515	$Dividends_{i,t-1}$	-0.00021	$Dividends_{i,t+1}$	0.62180
	(0.01)		(0.07)		(-0.29)		(0.40)		(-0.03)		(0.49)
$Earnings_{i,t-1}$	-0.00015***	$Earnings_{i,t-1}$	-0.00184	$Earnings_{i,t-1}$	-0.00091***	$Earnings_{i,t}$	0.01226	$Earnings_{i,t-1}$	-0.00024***	$Earnings_{i,t+1}$	0.01923
	(-5.29)		(-0.42)		(-12.37)		(1.32)		(-3.42)		(1.92)
$Growth_{i,t-1}$	0.00009***	$Growth_{i,t-1}$	-0.00364	$Growth_{i,t-1}$	0.00006*	$Growth_{i,t}$	0.00197	$Growth_{i,t-1}$	0.00004	$Growth_{i,t+1}$	0.00816
	(2.78)		(-0.92)		(1.79)		(0.46)		(0.97)		(0.77)
$Tangibility_{i,t-1}$	0.00735***	$Tangibility_{i,t-1}$	0.171679	$Tangibility_{i,t-1}$	0.00741***	$Tangibility_{i,t}$	0.05054	$Tangibility_{i,t-1}$	0.00472***	$Tangibility_{i,t+1}$	0.05631
	(5.68)		(0.87)		(5.53)		(0.28)		(2.69)		(0.3)
$NDTS_{i,t-1}$	-0.02711***	$NDTS_{i,t-1}$	-2.04685*	$NDTS_{i,t-1}$	-0.02541***	$NDTS_{i,t}$	-0.50156	$NDTS_{i,t-1}$	-0.00764	$NDTS_{i,t+1}$	-0.41796
	(-3.18)		(-1.82)		(-2.87)		(-0.42)		(-0.66)		(-0.33)
Adj R-square	0.0024			Adj R-square	0.0030			Adj R-square	0.0014		
N	251,097			N	238,519			N	225,953		
$\Delta Y_{i,t} \mid OR^U_{i,t}$	-0.04661			$\Delta Y_{i,t+1} \mid OR^U_{i,t+1}$	0.01534			$\Delta Y_{i,t+2} \mid OR^U_{i,t+2}$	0.02995		
$\Delta Y_{i,t} \mid OR^D_{i,t}$	-0.20648			$\Delta Y_{i,t+1} \mid OR^D_{i,t+1}$	0.06805***			$\Delta Y_{i,t+2} \mid OR^D_{i,t+1}$	0.07556***		

Table 5. 8 EPS change in response to equity issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.6a) and (5.6b) for non-financial firms. Y in (5.6b) is substituted as EPS in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) **One quarter before DCRC**				**Panel B ($\tau = 1$)** **In the quarter of DCRC**				**Panel C ($\tau = 2$)** **One quarter after DCRC**			
Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta EPS_{i,t}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta EPS_{i,t+1}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta EPS_{i,t+2}$	
Intercept	0.01851***	*Intercept*	1.57193***	*Intercept*	0.01355***	*Intercept*	0.06012	*Intercept*	0.01985***	*Intercept*	0.037129
	(17.97)		(2.34)		(13.39)		(1.00)		(13.23)		(0.58)
$OR^{U}{}_{i,t+1}$	0.00351	$\Delta eqt_{i,t}$	-88.2338***	$OR^{U}{}_{i,t+1}$	0.00733**	$\Delta eqt_{i,t}$	-1.05799***	$OR^{U}{}_{i,t+1}$	0.009147*	$\Delta eqt_{i,t}$	-1.31326***
	(1.12)		(-2.44)		(2.11)		(-3.79)		(1.77)		(-3.55)
$OR^{D}{}_{i,t+1}$	0.01143***			$OR^{D}{}_{i,t+1}$	0.00445			$OR^{D}{}_{i,t+1}$	0.00525		
	(5.14)				(1.57)				(1.24)		
$Leverage_{i,t-1}$	0.01449***	$Leverage_{i,t-1}$	1.30071***	$Leverage_{i,t-1}$	0.01057***	$Leverage_{i,t}$	-0.01051	$Leverage_{i,t-1}$	0.01805***	$Leverage_{i,t+1}$	-0.06848
	(9.33)		(2.30)		(6.97)		(-0.12)		(7.96)		(-0.72)
$Size_{i,t-1}$	-0.00968***	$Size_{i,t-1}$	-0.84243***	$Size_{i,t-1}$	-0.0092***	$Size_{i,t}$	0.00431	$Size_{i,t-1}$	-0.01047***	$Size_{i,t+1}$	0.01391
	(-45.69)		(-2.42)		(-43.93)		(0.34)		(-33.56)		(1.02)
$Price_{i,t-1}$	0.00846***	$Price_{i,t-1}$	0.77291***	$Price_{i,t-1}$	0.01100***	$Price_{i,t}$	-0.05212***	$Price_{i,t-1}$	0.00990***	$Price_{i,t+1}$	-0.03784*
	(26.38)		(2.51)		(34.69)		(-2.78)		(20.89)		(-1.89)
$Liquidity_{i,t-1}$	0.00743***	$Liquidity_{i,t-1}$	0.622621*	$Liquidity_{i,t-1}$	-0.00581***	$Liquidity_{i,t}$	0.07719	$Liquidity_{i,t-1}$	0.00811***	$Liquidity_{i,t+1}$	0.005566
	(3.73)		(1.75)		(-2.96)		(0.65)		(2.79)		(0.04)
$Profit_{i,t-1}$	-0.15964***	$Profit_{i,t-1}$	-15.11880***	$Profit_{i,t-1}$	-0.16115***	$Profit_{i,t}$	-0.37891***	$Profit_{i,t-1}$	-0.18794***	$Profit_{i,t+1}$	-1.73428***
	(-82.00)		(-2.61)		(-79.75)		(-4.47)		(-65.03)		(-8.72)
$Dividends_{i,t-1}$	-0.00352	$Dividends_{i,t-1}$	-0.15721	$Dividends_{i,t-1}$	-0.01214	$Dividends_{i,t}$	0.48061	$Dividends_{i,t-1}$	-0.00732	$Dividends_{i,t+1}$	0.71744
	(-0.39)		(-0.15)		(-1.36)		(0.58)		(-0.55)		(0.81)
$Earnings_{i,t-1}$	-0.00157***	$Earnings_{i,t-1}$	-0.13793***	$Earnings_{i,t-1}$	-0.00573***	$Earnings_{i,t}$	0.005076	$Earnings_{i,t-1}$	-0.00388***	$Earnings_{i,t+1}$	-0.00094
	(-30.59)		(-2.41)		(-51.97)		(0.8)		(-30.16)		(-0.31)
$Growth_{i,t-1}$	0.00300***	$Growth_{i,t-1}$	0.25774***	$Growth_{i,t-1}$	0.00242***	$Growth_{i,t}$	0.00270	$Growth_{i,t-1}$	0.00222***	$Growth_{i,t+1}$	0.00314
	(56.35)		(2.38)		(46.91)		(0.85)		(29.27)		(0.44)
$Tangibility_{i,t-1}$	0.00999***	$Tangibility_{i,t-1}$	0.91757***	$Tangibility_{i,t-1}$	0.01162***	$Tangibility_{i,t}$	0.02834	$Tangibility_{i,t-1}$	0.00833***	$Tangibility_{i,t+1}$	0.04776
	(6.23)		(2.25)		(7.45)		(0.31)		(3.58)		(0.49)
$NDTS_{i,t-1}$	-0.03122***	$NDTS_{i,t-1}$	-3.79801***	$NDTS_{i,t-1}$	-0.04049***	$NDTS_{i,t}$	-0.35743	$NDTS_{i,t-1}$	-0.02858*	$NDTS_{i,t+1}$	-0.39391
	(-2.91)		(-2.32)		(-3.87)		(-0.58)		(-1.84)		(-0.6)
Adj R-square	0.0598			Adj R-square	0.0544			Adj R-square	0.0303		
N	458,163			N	435,839			N	412,625		
$\Delta Y_{i,t} \mid OR^{U}_{i,t}$	-0.3097*			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	-0.00775**			$\Delta Y_{i,t+2} \mid OR^{U}_{i,t+1}$	-0.01201*		
$\Delta Y_{i,t} \mid OR^{D}_{i,t}$	-1.00851***			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	-0.00470			$\Delta Y_{i,t+2} \mid OR^{D}_{i,t+1}$	-0.00689		

Table 5. 9 Changes in EPS due to debt and equity issuance

Values of estimated coefficients and their *t-statistic* for Equation (5.7a) (5.7b) and (5.7c) for non-financial firms. Y in (5.7c) is substituted as EPS. Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take places at quarter *t+1*. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$ is change in EPS due to adjustment in debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$ is change in EPS due to adjustment in debt financing when downgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$ is change in EPS due to adjustment in equity financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$ is change in EPS due to adjustment in equity financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A (τ = 0)
One quarter before DCRC

Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta EPS_{i,t}$	
Intercept	0.01175***	*Intercept*	0.02223***	*Intercept*	-0.08836
	(15.11)		(14.38)		(-0.08)
$OR^{U}{}_{i,t+1}$	0.00497	$OR^{U}{}_{i,t+1}$	0.00845	$\Delta det_{i,t}$	-14.10970
	(1.60)		(1.37)		(-0.42)
$OR^{D}{}_{i,t+1}$	0.01781***	$OR^{D}{}_{i,t+1}$	0.00708	$\Delta eqt_{i,t}$	8.32902
	(7.32)		(1.46)		(0.13)
$Leverage_{i,t-1}$	-0.01644***	$Leverage_{i,t-1}$	0.01082***	$Leverage_{i,t-1}$	-0.16055
	(-13.03)		(4.32)		(-0.13)
$Size_{i,t-1}$	-0.00169***	$Size_{i,t-1}$	-0.01038***	$Size_{i,t-1}$	0.04999
	(-10.55)		(-32.69)		(0.08)
$Price_{i,t-1}$	0.00255***	$Price_{i,t-1}$	0.00959***	$Price_{i,t-1}$	0.01566
	(10.40)		(19.69)		(0.03)
$Liquidity_{i,t-1}$	-0.01891***	$Liquidity_{i,t-1}$	-0.00082	$Liquidity_{i,t-1}$	-0.29449
	(-13.00)		(-0.28)		(-0.48)
$Profit_{i,t-1}$	-0.00244**	$Profit_{i,t-1}$	-0.19425***	$Profit_{i,t-1}$	0.98786
	(-2.04)		(-81.58)		(0.08)
$Dividends_{i,t-1}$	-0.00025	$Dividends_{i,t-1}$	-0.00447	$Dividends_{i,t-1}$	0.06273
	(-0.05)		(-0.42)		(0.08)
$Earnings_{i,t-1}$	-0.00016***	$Earnings_{i,t-1}$	-0.00124***	$Earnings_{i,t-1}$	0.00787
	(-5.39)		(-20.94)		(0.11)
$Growth_{i,t-1}$	0.00008***	$Growth_{i,t-1}$	0.00196***	$Growth_{i,t-1}$	-0.01959
	(2.61)		(32.01)		(-0.16)
$Tangibility_{i,t-1}$	0.00687***	$Tangibility_{i,t-1}$	0.01435***	$Tangibility_{i,t-1}$	0.06082
	(5.10)		(5.36)		(0.08)
$NDTS_{i,t-1}$	-0.02747***	$NDTS_{i,t-1}$	-0.05633***	$NDTS_{i,t-1}$	-1.75316
	(-3.10)		(-3.19)		(-0.58)
Adj R-square			0.0397		
N			344,175		
$\Delta Y_{i,t}|OR^{U}_{i,t+1}$	0.00026	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$	-0.07013	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$	0.07038
$\Delta Y_{i,t}|OR^{D}_{i,t+1}$	-0.19232	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$	-0.25129	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$	0.05897

Table 5.9 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta EPS_{i,t+1}$	
Intercept	0.01066***	*Intercept*	0.01607***	*Intercept*	0.11721
	(13.11)		(10.64)		(1.04)
$OR^U{}_{i,t+1}$	0.00518	$OR^U{}_{i,t+1}$	0.00612	$\Delta det_{i,t}$	3.58077***
	(1.58)		(1.00)		(4.44)
$OR^D{}_{i,t+1}$	0.01865***	$OR^D{}_{i,t+1}$	0.00619	$\Delta eqt_{i,t}$	-0.82342*
	(7.28)		(1.30)		(-1.76)
$Leverage_{i,t-1}$	-0.01715***	$Leverage_{i,t-1}$	0.00894***	$Leverage_{i,t}$	-0.25421
	(-13.10)		(3.67)		(-1.36)
$Size_{i,t-1}$	-0.00170***	$Size_{i,t-1}$	-0.01004***	$Size_{i,t}$	0.03438
	(-10.11)		(-32.13)		(1.44)
$Price_{i,t-1}$	0.00303***	$Price_{i,t-1}$	0.01219***	$Price_{i,t}$	-0.13422***
	(11.77)		(25.45)		(-3.74)
$Liquidity_{i,t-1}$	-0.02087***	$Liquidity_{i,t-1}$	-0.01300***	$Liquidity_{i,t}$	0.11383
	(-13.72)		(-4.60)		(0.53)
$Profit_{i,t-1}$	0.00277***	$Profit_{i,t-1}$	-0.16476***	$Profit_{i,t}$	-0.18941
	(2.11)		(-67.74)		(-1.55)
$Dividends_{i,t-1}$	-0.00203	$Dividends_{i,t-1}$	-0.01482	$Dividends_{i,t}$	0.57312
	(-0.36)		(-1.42)		(0.38)
$Earnings_{i,t-1}$	-0.00105***	$Earnings_{i,t-1}$	-0.00584***	$Earnings_{i,t}$	0.00972
	(-13.30)		(-39.71)		(0.93)
$Growth_{i,t-1}$	0.00005	$Growth_{i,t-1}$	0.00159***	$Growth_{i,t}$	0.00242
	(1.43)		(27.04)		(0.53)
$Tangibility_{i,t-1}$	0.00695***	$Tangibility_{i,t-1}$	0.01593***	$Tangibility_{i,t}$	0.05190
	(4.97)		(6.14)		(0.27)
$NDTS_{i,t-1}$	-0.02608***	$NDTS_{i,t-1}$	-0.06539***	$NDTS_{i,t}$	-0.38835
	(-2.82)		(-3.81)		(-0.3)
Adj R-square			0.0456		
N			326,949		
$\Delta Y_{i,t+1} \mid OR^U_{i,t+1}$	0.01351	$\Delta Y_{i,t+1} \mid (\Delta det_{i,t} \mid OR^U_{i,t+1})$	0.01855	$\Delta Y_{i,t+1} \mid (\Delta eqt_{i,t} \mid OR^U_{i,t+1})$	-0.00504
$\Delta Y_{i,t+1} \mid OR^D_{i,t+1}$	0.06168***	$\Delta Y_{i,t+1} \mid (\Delta det_{i,t} \mid OR^D_{i,t+1})$	0.06678***	$\Delta Y_{i,t+1} \mid (\Delta eqt_{i,t} \mid OR^D_{i,t+1})$	-0.00510

Table 5.9 *(continued)*

Panel C (τ = 2) One quarter after DCRC					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta EPS_{i,t+2}$	
Intercept	0.01149***	*Intercept*	0.02460***	*Intercept*	0.09767***
	(10.77)		(9.81)		(0.81)
$OR^U{}_{i,t+1}$	0.00740*	$OR^U{}_{i,t+1}$	0.00813	$\Delta det_{i,t}$	4.67808***
	(1.70)		(0.80)		(3.18)
$OR^D{}_{i,t+1}$	0.01656***	$OR^D{}_{i,t+1}$	0.00786	$\Delta eqt_{i,t}$	-0.96366
	(4.91)		(0.99)		(-1.61)
$Leverage_{i,t-1}$	-0.01453***	$Leverage_{i,t-1}$	0.02063***	$Leverage_{i,t+1}$	-0.30911
	(-8.38)		(5.06)		(-1.52)
$Size_{i,t-1}$	-0.00164***	$Size_{i,t-1}$	-0.01162***	$Size_{i,t+1}$	0.04582*
	(-7.41)		(-22.29)		(1.78)
$Price_{i,t-1}$	0.00250***	$Price_{i,t-1}$	0.01039***	$Price_{i,t+1}$	-0.14019***
	(7.35)		(12.97)		(-3.61)
$Liquidity_{i,t-1}$	-0.02093***	$Liquidity_{i,t-1}$	0.00204	$Liquidity_{i,t+1}$	0.10923
	(-10.46)		(0.43)		(0.47)
$Profit_{i,t-1}$	0.00072	$Profit_{i,t-1}$	-0.19494***	$Profit_{i,t+1}$	-1.31192***
	(0.44)		(-50.72)		(-3.80)
$Dividends_{i,t-1}$	-0.00086	$Dividends_{i,t-1}$	-0.01062	$Dividends_{i,t+1}$	0.66675
	(-0.12)		(-0.62)		(0.46)
$Earnings_{i,t-1}$	-0.00028***	$Earnings_{i,t-1}$	-0.00352***	$Earnings_{i,t+1}$	0.01687
	(-3.76)		(-19.89)		(1.47)
$Growth_{i,t-1}$	0.00004	$Growth_{i,t-1}$	0.00146***	$Growth_{i,t+1}$	0.01074
	(1.00)		(14.99)		(0.91)
$Tangibility_{i,t-1}$	0.00408**	$Tangibility_{i,t-1}$	0.01094***	$Tangibility_{i,t+1}$	0.05956
	(2.21)		(2.52)		(0.29)
$NDTS_{i,t-1}$	-0.00721	$NDTS_{i,t-1}$	-0.05628*	$NDTS_{i,t+1}$	-0.30866
	(-0.59)		(-1.97)		(-0.23)
Adj R-square			0.0217		
N			309,711		
$\Delta Y_{i,t+2} \mid OR^U_{i,t+1}$	0.02678*	$\Delta Y_{i,t+2} \mid (\Delta det_{i,t} \mid OR^U_{i,t+1})$	0.03462*	$\Delta Y_{i,t+2} \mid (\Delta eqt_{i,t} \mid OR^U_{i,t+1})$	-0.00783
$\Delta Y_{i,t+2} \mid OR^D_{i,t+1}$	0.06989***	$\Delta Y_{i,t+2} \mid (\Delta det_{i,t} \mid OR^D_{i,t+1})$	0.07747***	$\Delta Y_{i,t+2} \mid (\Delta eqt_{i,t} \mid OR^D_{i,t+1})$	-0.00757

Table 5. 10 Changes in Tobin's Q in response to net debt issuance

The The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.4a) and (5.4b) for non-financial firms. Y in (5.4b) is substituted as Tobin's Q in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) Two quarters after DCRC**			
Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta TobinQ_{i,t}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta TobinQ_{i,t}$		Equation (a) $\Delta net_{i,t}$		Equation (b) $\Delta TobinQ_{i,t+2}$	
$Intercept$	-0.00941***	$Intercept$	1.03183***	$Intercept$	-0.00438***	$Intercept$	0.93848***	$Intercept$	-0.01328***	$Intercept$	0.52715***
	(-5.67)		(3.31)		(-2.58)		(47.48)		(-4.55)		(29.74)
$OR^{U}{}_{i,t+1}$	-0.00134	$\Delta net_{i,t}$	11.56987	$OR^{U}{}_{i,t+1}$	-0.00104	$\Delta net_{i,t}$	-1.79956***	$OR^{U}{}_{i,t+1}$	-0.00201	$\Delta net_{i,t}$	-1.80008***
	(-0.21)		(0.37)		(-0.15)		(-25.48)		(-0.17)		(-23.53)
$OR^{D}{}_{i,t+1}$	0.00899*			$OR^{D}{}_{i,t+1}$	0.01057*			$OR^{D}{}_{i,t+1}$	0.00797		
	(1.71)				(1.95)				(0.88)		
$Leverage_{i,t-1}$	-0.02771***	$Leverage_{i,t-1}$	0.16323	$Leverage_{i,t-1}$	-0.02639***	$Leverage_{i,t}$	-0.05944*	$Leverage_{i,t-1}$	-0.03464***	$Leverage_{i,t+1}$	-0.05907**
	(-10.29)		(0.19)		(-9.63)		(-1.88)		(-7.31)		(-2.09)
$Size_{i,t-1}$	0.00852***	$Size_{i,t-1}$	-0.28827	$Size_{i,t-1}$	0.00824***	$Size_{i,t}$	-0.20577***	$Size_{i,t-1}$	0.01007***	$Size_{i,t+1}$	-0.09481***
	(24.93)		(-1.07)		(23.41)		(-50.03)		(16.60)		(-25.46)
$Price_{i,t-1}$	-0.00722***	$Price_{i,t-1}$	0.36533	$Price_{i,t-1}$	-0.00935***	$Price_{i,t}$	0.43062***	$Price_{i,t-1}$	-0.00755***	$Price_{i,t+1}$	0.21847***
	(-13.81)		(1.60)		(-17.35)		(69.10)		(-8.11)		(38.57)
$Liquidity_{i,t-1}$	-0.01908***	$Liquidity_{i,t-1}$	0.64244	$Liquidity_{i,t-1}$	-0.00866***	$Liquidity_{i,t}$	0.93931***	$Liquidity_{i,t-1}$	-0.02187***	$Liquidity_{i,t+1}$	0.63933***
	(-6.13)		(1.04)		(-2.72)		(25.04)		(-4.00)		(18.93)
$Profit_{i,t-1}$	0.19339***	$Profit_{i,t-1}$	3.38815	$Profit_{i,t-1}$	0.17344***	$Profit_{i,t}$	-0.25222***	$Profit_{i,t-1}$	0.18856***	$Profit_{i,t+1}$	-0.10756**
	(74.83)		(0.56)		(62.61)		(-11.90)		(42.57)		(-2.16)
$Dividends_{i,t-1}$	0.01344	$Dividends_{i,t-1}$	-1.89627	$Dividends_{i,t-1}$	0.05553**	$Dividends_{i,t}$	-0.09619	$Dividends_{i,t-1}$	0.00566	$Dividends_{i,t+1}$	-0.15028
	(0.61)		(-1.50)		(2.22)		(-0.37)		(0.29)		(-0.72)
$Earnings_{i,t-1}$	0.00085***	$Earnings_{i,t-1}$	-0.26920***	$Earnings_{i,t-1}$	0.00461***	$Earnings_{i,t}$	-0.11611***	$Earnings_{i,t-1}$	0.00319***	$Earnings_{i,t+1}$	-0.05917***
	(14.44)		(-10.09)		(27.91)		(-62.49)		(15.65)		(-35.36)
$Growth_{i,t-1}$	-0.00169***	$Growth_{i,t-1}$	-0.57040***	$Growth_{i,t-1}$	-0.00157***	$Growth_{i,t}$	-0.73018***	$Growth_{i,t-1}$	-0.00194***	$Growth_{i,t+1}$	-0.44879***
	(-25.85)		(-10.74)		(-23.58)		(-914.78)		(-17.37)		(-263.40)
$Tangibility_{i,t-1}$	-0.00785***	$Tangibility_{i,t-1}$	0.34255	$Tangibility_{i,t-1}$	-0.00987***	$Tangibility_{i,t}$	0.05553	$Tangibility_{i,t-1}$	-0.00676	$Tangibility_{i,t+1}$	0.05111*
	(-2.72)		(1.19)		(-3.38)		(1.64)		(-1.34)		(1.69)
$NDTS_{i,t-1}$	0.03166*	$NDTS_{i,t-1}$	-3.67337***	$NDTS_{i,t-1}$	0.04041**	$NDTS_{i,t}$	-3.13033***	$NDTS_{i,t-1}$	0.04626	$NDTS_{i,t+1}$	-1.68666***
	(1.67)		(-2.57)		(2.09)		(-13.88)		(1.39)		(-8.41)
Adj R-square	0.1939			Adj R-square	0.7994			Adj R-square	0.2625		
N	222,817			N	212,149			N	206,467		
$\Delta Y_{i,t} \mid OR^{U}_{i,t+1}$	-0.01550			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	0.00187			$\Delta Y_{i,t+2} \mid OR^{U}_{i,t+1}$	0.00362		
$\Delta Y_{i,t} \mid OR^{D}_{i,t+1}$	0.10401			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	-0.01902*			$\Delta Y_{i,t+2} \mid OR^{D}_{i,t+1}$	-0.01435		

Table 5. 11 Changes in Tobin's Q in response to debt issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.5a) and (5.5b) for non-financial firms. Y in (5.5b) is substituted as Tobin's Q in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^{U}{}_{i,t+1}$ and $OR^{U}{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta TobinQ_{i,t}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta TobinQ_{i,t+1}$		Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta TobinQ_{i,t+2}$	
Intercept	0.01136***	*Intercept*	0.80402***	*Intercept*	0.01041***	*Intercept*	0.94831***	*Intercept*	0.01113***	*Intercept*	0.51559***
	(15.22)		(4.39)		(13.43)		(49.04)		(11.07)		(30.18)
$OR^{U}{}_{i,t+1}$	0.00532*	$\Delta det_{i,t}$	7.39256	$OR^{U}{}_{i,t+1}$	0.00427	$\Delta det_{i,t}$	-0.33247***	$OR^{U}{}_{i,t+1}$	0.00637	$\Delta det_{i,t}$	2.04430***
	(1.81)		(0.50)		(1.38)		(-2.39)		(1.56)		(10.00)
$OR^{D}{}_{i,t+1}$	0.01686***			$OR^{D}{}_{i,t+1}$	0.01712***			$OR^{D}{}_{i,t+1}$	0.01549***		
	(7.10)				(6.90)				(4.86)		
$Leverage_{i,t-1}$	-0.01590***	$Leverage_{i,t-1}$	-0.01149	$Leverage_{i,t-1}$	-0.01648***	$Leverage_{i,t}$	-0.05930*	$Leverage_{i,t-1}$	-0.01446***	$Leverage_{i,t+1}$	-0.05525*
	(-13.14)		(-0.04)		(-13.21)		(-1.86)		(-8.85)		(-1.93)
$Size_{i,t-1}$	-0.00167***	$Size_{i,t-1}$	-0.18118***	$Size_{i,t-1}$	-0.00169***	$Size_{i,t}$	-0.22369***	$Size_{i,t-1}$	-0.00165***	$Size_{i,t+1}$	-0.10054***
	(-11.01)		(-6.32)		(-10.68)		(-56.10)		(-7.97)		(-28.23)
$Price_{i,t-1}$	0.00252***	$Price_{i,t-1}$	0.27845***	$Price_{i,t-1}$	0.00290***	$Price_{i,t}$	0.44880***	$Price_{i,t-1}$	0.00253***	$Price_{i,t+1}$	0.20314***
	(10.73)		(6.17)		(11.80)		(73.33)		(7.88)		(36.93)
$Liquidity_{i,t-1}$	-0.01803***	$Liquidity_{i,t-1}$	0.67102**	$Liquidity_{i,t-1}$	-0.01962***	$Liquidity_{i,t}$	1.09393***	$Liquidity_{i,t-1}$	-0.02072***	$Liquidity_{i,t+1}$	0.78493***
	(-13.14)		(2.22)		(-13.78)		(30.68)		(-11.22)		(25.08)
$Profit_{i,t-1}$	-0.00350***	$Profit_{i,t-1}$	5.55635***	$Profit_{i,t-1}$	0.00170	$Profit_{i,t}$	-0.29263***	$Profit_{i,t-1}$	-0.00030	$Profit_{i,t+1}$	-0.21494***
	(-2.93)		(39.72)		(1.31)		(-13.61)		(-0.19)		(-4.47)
$Dividends_{i,t-1}$	-0.00033	$Dividends_{i,t-1}$	-1.61011	$Dividends_{i,t-1}$	-0.00648***	$Dividends_{i,t}$	-0.25900	$Dividends_{i,t-1}$	0.00014	$Dividends_{i,t+1}$	-0.22328
	(-0.04)		(-1.60)		(-0.62)		(-1.08)		(0.02)		(-1.14)
$Earnings_{i,t-1}$	-0.00013***	$Earnings_{i,t-1}$	-0.25275***	$Earnings_{i,t-1}$	-0.00092***	$Earnings_{i,t}$	-0.11605***	$Earnings_{i,t-1}$	-0.00024***	$Earnings_{i,t+1}$	-0.05490***
	(-4.69)		(-72.06)		(-12.54)		(-66.15)		(-3.42)		(-35.50)
$Growth_{i,t-1}$	0.00007**	$Growth_{i,t-1}$	-0.58596	$Growth_{i,t-1}$	0.00004	$Growth_{i,t}$	-0.72165***	$Growth_{i,t-1}$	0.00011***	$Growth_{i,t+1}$	-0.42147***
	(2.15)		(-170.17)		(1.34)		(-891.58)		(2.76)		(-256.59)
$Tangibility_{i,t-1}$	0.00695***	$Tangibility_{i,t-1}$	0.19071	$Tangibility_{i,t-1}$	0.00692***	$Tangibility_{i,t}$	0.07515***	$Tangibility_{i,t-1}$	0.00464***	$Tangibility_{i,t+1}$	0.06456**
	(5.33)		(1.08)		(5.16)		(2.25)		(2.65)		(2.21)
$NDTS_{i,t-1}$	-0.02371***	$NDTS_{i,t-1}$	-3.12451***	$NDTS_{i,t-1}$	-0.02218***	$NDTS_{i,t}$	-3.18737***	$NDTS_{i,t-1}$	-0.00721	$NDTS_{i,t+1}$	-1.56319***
	(-2.76)		(-3.16)		(-2.51)		(-14.37)		(-0.63)		(-8.05)
Adj R-square	0.1506			Adj R-square	0.7743			Adj R-square	0.2295		
N	243,817			N	232,165			N	225,931		
$\Delta Y_{i,t} \mid OR^{U}_{i,t+1}$	0.03933			$\Delta Y_{i,t+1} \mid OR^{U}_{i,t+1}$	-0.00142			$\Delta Y_{i,t+2} \mid OR^{U}_{i,t+1}$	0.01302		
$\Delta Y_{i,t} \mid OR^{D}_{i,t+1}$	0.12464			$\Delta Y_{i,t+1} \mid OR^{D}_{i,t+1}$	-0.00569***			$\Delta Y_{i,t+2} \mid OR^{D}_{i,t+1}$	0.03167***		

Table 5. 12 Changes in Tobin's Q in response to equity issuance

The table reports the parameter estimates of the two-equation simultaneous systems estimated by *3SLS*. Values of estimated coefficients and their *t-statistic* in brackets for Equation (5.6a) and (5.6b) for non-financial firms. Y in (5.6b) is substituted as Tobin's Q in the tests. Estimated parameters on rating change indicators indicate influences of delayed credit rating changes on financing plan making. The three panels show the financing adjustments during the three periods around DCRC respectively. $OR^U{}_{i,t+1}$ and $OR^U{}_{i,t+1}$ are upgrade and downgrade of overall credit rating. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$) One quarter before DCRC				**Panel B ($\tau = 1$) In the quarter of DCRC**				**Panel C ($\tau = 2$) One quarter after DCRC**			
Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta TobinQ_{i,t}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta TobinQ_{i,t+1}$		Equation (a) $\Delta eqt_{i,t}$		Equation (b) $\Delta TobinQ_{i,t+2}$	
Intercept	0.01798*** (18.46)	*Intercept*	0.51055* (1.65)	*Intercept*	0.01251*** (12.63)	*Intercept*	0.82510*** (63.03)	*Intercept*	0.01923*** (12.89)	*Intercept*	0.43247*** (37.79)
$OR^U{}_{i,t+1}$	0.00729*** (2.26)	$\Delta eqt_{i,t}$	13.80816 (0.81)	$OR^U{}_{i,t+1}$	0.00622* (1.86)	$\Delta eqt_{i,t}$	2.41081*** (38.53)	$OR^U{}_{i,t+1}$	0.01003** (2.00)	$\Delta eqt_{i,t}$	2.75188*** (41.67)
$OR^D{}_{i,t+1}$	0.00531** (1.99)			$OR^D{}_{i,t+1}$	0.00442 (1.58)			$OR^D{}_{i,t+1}$	0.00481 (1.17)		
$Leverage_{i,t-1}$	0.01259*** (8.56)	$Leverage_{i,t-1}$	-0.26394 (-1.13)	$Leverage_{i,t-1}$	0.01064*** (7.16)	$Leverage_{i,t}$	-0.12627*** (-6.48)	$Leverage_{i,t-1}$	0.01838*** (8.17)	$Leverage_{i,t+1}$	-0.09423*** (-5.53)
$Size_{i,t-1}$	-0.00934*** (-46.42)	$Size_{i,t-1}$	-0.0387 (-0.24)	$Size_{i,t-1}$	-0.00894*** (-43.54)	$Size_{i,t}$	-0.16572*** (-60.05)	$Size_{i,t-1}$	-0.01040*** (-33.56)	$Size_{i,t+1}$	-0.05256*** (-21.53)
$Price_{i,t-1}$	0.00891*** (29.31)	$Price_{i,t-1}$	0.151616 (0.99)	$Price_{i,t-1}$	0.01085*** (34.91)	$Price_{i,t}$	0.36552*** (89.23)	$Price_{i,t-1}$	0.00946*** (20.14)	$Price_{i,t+1}$	0.12387*** (34.57)
$Liquidity_{i,t-1}$	0.00640*** (3.38)	$Liquidity_{i,t-1}$	0.582585*** (3.97)	$Liquidity_{i,t-1}$	-0.00494*** (-2.57)	$Liquidity_{i,t}$	1.008341** (38.59)	$Liquidity_{i,t-1}$	0.00800*** (2.77)	$Liquidity_{i,t+1}$	0.65383*** (28.38)
$Profit_{i,t-1}$	-0.19057*** (-100.60)	$Profit_{i,t-1}$	7.615218*** (2.33)	$Profit_{i,t-1}$	-0.16530*** (-82.58)	$Profit_{i,t}$	-0.28685*** (-15.67)	$Profit_{i,t-1}$	-0.17352*** (-61.34)	$Profit_{i,t+1}$	-0.25121*** (-7.23)
$Dividends_{i,t-1}$	-0.00235 (-0.16)	$Dividends_{i,t-1}$	-1.32373* (-1.78)	$Dividends_{i,t-1}$	-0.03682*** (-2.28)	$Dividends_{i,t}$	0.18989 (1.06)	$Dividends_{i,t-1}$	-0.00232 (-0.18)	$Dividends_{i,t+1}$	0.11602 (0.74)
$Earnings_{i,t-1}$	-0.00116*** (-25.71)	$Earnings_{i,t-1}$	-0.23429*** (-11.68)	$Earnings_{i,t-1}$	-0.00555*** (-51.60)	$Earnings_{i,t}$	-0.11957*** (-86.24)	$Earnings_{i,t-1}$	-0.00415*** (-33.11)	$Earnings_{i,t+1}$	-0.01546*** (-28.84)
$Growth_{i,t-1}$	0.00253*** (50.32)	$Growth_{i,t-1}$	-0.60384*** (-13.90)	$Growth_{i,t-1}$	0.00249*** (49.01)	$Growth_{i,t}$	-0.69601*** (-1002.6)	$Growth_{i,t-1}$	0.00268*** (36.23)	$Growth_{i,t+1}$	-0.37532*** (-298.85)
$Tangibility_{i,t-1}$	0.01048*** (6.90)	$Tangibility_{i,t-1}$	-0.06018 (-0.31)	$Tangibility_{i,t-1}$	0.01184*** (7.75)	$Tangibility_{i,t}$	0.02118 (1.05)	$Tangibility_{i,t-1}$	0.00846*** (3.65)	$Tangibility_{i,t+1}$	0.00824*** (0.47)
$NDTS_{i,t-1}$	-0.03417*** (-3.37)	$NDTS_{i,t-1}$	-1.47331* (-1.91)	$NDTS_{i,t-1}$	-0.04015*** (-3.92)	$NDTS_{i,t}$	-2.06545*** (-15.23)	$NDTS_{i,t-1}$	-0.02652* (-1.72)	$NDTS_{i,t+1}$	-0.78240*** (-6.62)
Adj R-square	0.1580			Adj R-square	0.7042			Adj R-square	0.1953		
N	445,105			N	424,511			N	412,843		
$\Delta Y_{i,t} \mid OR^U_{i,t+1}$	0.10066			$\Delta Y_{i,t+1} \mid OR^U_{i,t+1}$	0.01500*			$\Delta Y_{i,t+2} \mid OR^U_{i,t+1}$	0.02760**		
$\Delta Y_{i,t} \mid OR^D_{i,t+1}$	0.07332			$\Delta Y_{i,t+1} \mid OR^D_{i,t+1}$	0.01066			$\Delta Y_{i,t+2} \mid OR^D_{i,t+1}$	0.01324		

Table 5. 13 Changes in Tobin's Q due to debt and equity issuance

Values of estimated coefficients and their *t-statistic* for Equation (5.7a) (5.7b) and (5.7c) for non-financial firms. Y in (5.7c) is substituted as Tobin's Q. Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take places at quarter *t+1*. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$ is change in Tobin's Q due to adjustment in debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$ is change in Tobin's Q due to adjustment in debt financing when downgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$ is change in Tobin's Q due to adjustment in equity financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$ is change in Tobin's Q due to adjustment in equity financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A ($\tau = 0$)
One quarter before DCRC

Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta TobinQ_{i,t}$	
Intercept	0.01148***	*Intercept*	0.02090***	*Intercept*	0.71387
	(14.69)		(14.35)		(0.67)
$OR^{U}{}_{i,t+1}$	0.00626**	$OR^{U}{}_{i,t+1}$	0.00800	$\Delta det_{i,t}$	3.72664
	(2.02)		(1.39)		(0.09)
$OR^{D}{}_{i,t+1}$	0.01621***	$OR^{D}{}_{i,t+1}$	0.00728	$\Delta eqt_{i,t}$	8.01507
	(6.53)		(1.58)		(0.11)
$Leverage_{i,t-1}$	-0.01603***	$Leverage_{i,t-1}$	0.01167***	$Leverage_{i,t-1}$	-0.19376
	(-12.63)		(4.93)		(-0.13)
$Size_{i,t-1}$	-0.00164***	$Size_{i,t-1}$	-0.01016***	$Size_{i,t-1}$	-0.10244
	(-10.18)		(-33.86)		(-0.16)
$Price_{i,t-1}$	0.00248***	$Price_{i,t-1}$	0.00970***	$Price_{i,t-1}$	0.19482
	(10.05)		(21.12)		(0.33)
$Liquidity_{i,t-1}$	-0.01829***	$Liquidity_{i,t-1}$	0.00079	$Liquidity_{i,t-1}$	0.48226
	(-12.48)		(0.29)		(0.6)
$Profit_{i,t-1}$	-0.00316***	$Profit_{i,t-1}$	-0.19655***	$Profit_{i,t-1}$	7.21299
	(-2.60)		(-86.61)		(0.53)
$Dividends_{i,t-1}$	-0.00049	$Dividends_{i,t-1}$	-0.01392	$Dividends_{i,t-1}$	-1.62629
	(-0.05)		(-0.72)		(-1.07)
$Earnings_{i,t-1}$	-0.00013***	$Earnings_{i,t-1}$	-0.00098***	$Earnings_{i,t-1}$	-0.25106***
	(-4.78)		(-19.01)		(-3.92)
$Growth_{i,t-1}$	0.00006**	$Growth_{i,t-1}$	0.00176***	$Growth_{i,t-1}$	-0.60429***
	(2.01)		(30.52)		(-4.99)
$Tangibility_{i,t-1}$	0.00652***	$Tangibility_{i,t-1}$	0.01437***	$Tangibility_{i,t-1}$	0.11152
	(4.81)		(5.68)		(0.14)
$NDTS_{i,t-1}$	-0.02435***	$NDTS_{i,t-1}$	-0.05601***	$NDTS_{i,t-1}$	-2.76875
	(-2.73)		(-3.37)		(-0.86)
Adj R-square			0.1319		
N			334,224		
$\Delta Y_{i,t}|OR^{U}_{i,t+1}$	0.08745	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{U}_{i,t+1})$	0.02333	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{U}_{i,t+1})$	0.06412
$\Delta Y_{i,t}|OR^{D}_{i,t+1}$	0.11876	$\Delta Y_{i,t}|(\Delta det_{i,t}|OR^{D}_{i,t+1})$	0.06041	$\Delta Y_{i,t}|(\Delta eqt_{i,t}|OR^{D}_{i,t+1})$	0.05835

Table 5.13 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta TobinQ_{i,t+1}$	
Intercept	0.01042***	*Intercept*	0.01471***	*Intercept*	0.92929***
	(12.81)		(9.92)		(47.00)
$OR^U{}_{i,t+1}$	0.00517	$OR^U{}_{i,t+1}$	0.00616	$\Delta det_{i,t}$	-0.23082
	(1.59)		(1.05)		(-1.62)
$OR^D{}_{i,t+1}$	0.01698***	$OR^D{}_{i,t+1}$	0.00625	$\Delta eqt_{i,t}$	2.27954***
	(6.54)		(1.32)		(27.21)
$Leverage_{i,t-1}$	-0.01672***	$Leverage_{i,t-1}$	0.01010***	$Leverage_{i,t}$	-0.11146***
	(-12.76)		(4.23)		(-3.41)
$Size_{i,t-1}$	-0.00164***	$Size_{i,t-1}$	-0.00989***	$Size_{i,t}$	-0.19684***
	(-9.75)		(-32.21)		(-46.89)
$Price_{i,t-1}$	0.00291***	$Price_{i,t-1}$	0.01225***	$Price_{i,t}$	0.42096***
	(11.30)		(26.06)		(66.96)
$Liquidity_{i,t-1}$	-0.02022***	$Liquidity_{i,t-1}$	-0.01124***	$Liquidity_{i,t}$	0.92678***
	(-13.27)		(-4.05)		(24.51)
$Profit_{i,t-1}$	0.00255*	$Profit_{i,t-1}$	-0.17021***	$Profit_{i,t}$	-0.24783***
	(1.92)		(-70.48)		(-11.70)
$Dividends_{i,t-1}$	-0.00870	$Dividends_{i,t-1}$	-0.06389***	$Dividends_{i,t}$	-0.05535
	(-0.72)		(-2.93)		(-0.21)
$Earnings_{i,t-1}$	-0.00107***	$Earnings_{i,t-1}$	-0.00567***	$Earnings_{i,t}$	-0.11366***
	(-13.51)		(-39.34)		(-61.14)
$Growth_{i,t-1}$	0.00004	$Growth_{i,t-1}$	0.00161***	$Growth_{i,t}$	-0.73046***
	(1.13)		(27.73)		(-915.05)
$Tangibility_{i,t-1}$	0.00653***	$Tangibility_{i,t-1}$	0.01632***	$Tangibility_{i,t}$	0.05071
	(4.67)		(6.40)		(1.49)
$NDTS_{i,t-1}$	-0.02309***	$NDTS_{i,t-1}$	-0.06333***	$NDTS_{i,t}$	-3.08188***
	(-2.50)		(-3.76)		(-13.66)
Adj R-square			0.7279		
N			318,222		
$\Delta Y_{i,t+1}\|OR^U_{i,t+1}$	0.01285	$\Delta Y_{i,t+1}\|(\Delta det_{i,t}\|OR^U_{i,t+1})$	-0.00119	$\Delta Y_{i,t+1}\|(\Delta eqt_{i,t}\|OR^U_{i,t+1})$	0.01404
$\Delta Y_{i,t+1}\|OR^D_{i,t+1}$	0.01033	$\Delta Y_{i,t+1}\|(\Delta det_{i,t}\|OR^D_{i,t+1})$	-0.00392	$\Delta Y_{i,t+1}\|(\Delta eqt_{i,t}\|OR^D_{i,t+1})$	0.01425

Table 5.13 *(continued)*

Panel C (τ = 2) One quarter after DCRC					
Equation (a) $\Delta det_{i,t}$		Equation (b) $\Delta eqt_{i,t}$		Equation (c) $\Delta TobinQ_{i,t+2}$	
Intercept	0.01148***	*Intercept*	0.02425***	*Intercept*	0.48979***
	(10.77)		(9.70)		(27.42)
$OR^U{}_{i,t+1}$	0.00749*	$OR^U{}_{i,t+1}$	0.00841	$\Delta det_{i,t}$	2.17745***
	(1.72)		(0.84)		(10.16)
$OR^D{}_{i,t+1}$	0.01653***	$OR^D{}_{i,t+1}$	0.00650	$\Delta eqt_{i,t}$	2.28375***
	(4.89)		(0.84)		(25.79)
$Leverage_{i,t-1}$	-0.01672***	$Leverage_{i,t-1}$	0.02313***	$Leverage_{i,t+1}$	-0.11210***
	(-8.28)		(5.68)		(-3.71)
$Size_{i,t-1}$	-0.00166***	$Size_{i,t-1}$	-0.01170***	$Size_{i,t+1}$	-0.08261***
	(-7.49)		(-22.54)		(-21.65)
$Price_{i,t-1}$	0.00250***	$Price_{i,t-1}$	0.00992***	$Price_{i,t+1}$	0.20646***
	(7.35)		(12.45)		(36.00)
$Liquidity_{i,t-1}$	-0.02097***	$Liquidity_{i,t-1}$	0.00264	$Liquidity_{i,t+1}$	0.67587***
	(-10.49)		(0.56)		(19.70)
$Profit_{i,t-1}$	0.00126	$Profit_{i,t-1}$	-0.18514***	$Profit_{i,t+1}$	-0.10420**
	(0.77)		(-48.86)		(-2.09)
$Dividends_{i,t-1}$	-0.00063	$Dividends_{i,t-1}$	-0.00635	$Dividends_{i,t+1}$	-0.12997
	(-0.09)		(-0.38)		(-0.62)
$Earnings_{i,t-1}$	-0.00028***	$Earnings_{i,t-1}$	-0.00341***	$Earnings_{i,t+1}$	-0.05710***
	(-3.67)		(-19.61)		(-34.05)
$Growth_{i,t-1}$	0.00007	$Growth_{i,t-1}$	0.00194***	$Growth_{i,t+1}$	-0.44970***
	(1.64)		(20.38)		(-262.76)
$Tangibility_{i,t-1}$	0.00398**	$Tangibility_{i,t-1}$	0.01032***	$Tangibility_{i,t+1}$	0.04481
	(2.16)		(2.38)		(1.47)
$NDTS_{i,t-1}$	-0.00650	$NDTS_{i,t-1}$	-0.05307*	$NDTS_{i,t+1}$	-1.61836***
	(-0.54)		(-1.87)		(-8.01)
Adj R-square			0.1968		
N			309,699		
$\Delta Y_{i,t+2}\|OR^U_{i,t+1}$	0.03552	$\Delta Y_{i,t+2}\|(\Delta det_{i,t}\|OR^U_{i,t+1})$	0.01631*	$\Delta Y_{i,t+2}\|(\Delta eqt_{i,t}\|OR^U_{i,t+1})$	0.01921
$\Delta Y_{i,t+2}\|OR^D_{i,t+1}$	0.05084	$\Delta Y_{i,t+2}\|(\Delta det_{i,t}\|OR^D_{i,t+1})$	0.03599***	$\Delta Y_{i,t+2}\|(\Delta eqt_{i,t}\|OR^D_{i,t+1})$	0.01484

Table 5. 14 Long-term debt and short-term debt effects on changes in ROA

Values of estimated coefficients and their *t-statistic* for Equation (5.8a) (5.8b) and (5.8c) for non-financial firms. Y in (5.8c) is substituted as ROA. Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take place at quarter *t+1*. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{U}_{i,t+1})$ is change in ROA due to adjustment in long-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{D}_{i,t+1})$ is change in ROA due to adjustment in long-term debt financing when downgrade is anticipated $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{U}_{i,t+1})$ is change in ROA due to adjustment in short-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{D}_{i,t+1})$is change in ROA due to adjustment in short-term debt financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A (τ = 0)
One quarter before DCRC

Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta ROA_{i,t}$	
Intercept	0.00418***	*Intercept*	0.00739***	*Intercept*	0.00174
	(6.35)		(17.18)		(0.02)
$OR^{U}_{i,t+1}$	0.00323	$OR^{U}_{i,t+1}$	0.00204	$\Delta Ldet_{i,t}$	-0.35237
	(1.23)		(1.19)		(-0.10)
$OR^{D}_{i,t+1}$	0.01430***	$OR^{D}_{i,t+1}$	0.00376***	$\Delta Sdet_{i,t}$	-5.97613
	(6.94)		(2.79)		(-0.48)
$Leverage_{i,t-1}$	-0.00478***	$Leverage_{i,t-1}$	-0.01157***	$Leverage_{i,t-1}$	-0.09164
	(-4.48)		(-16.62)		(-0.72)
$Size_{i,t-1}$	-0.00115	$Size_{i,t-1}$	-0.00054***	$Size_{i,t-1}$	0.00625**
	(-8.61)		(-6.18)		(2.08)
$Price_{i,t-1}$	0.00209	$Price_{i,t-1}$	0.00049***	$Price_{i,t-1}$	0.01249***
	(10.06)		(3.59)		(5.56)
$Liquidity_{i,t-1}$	-0.00676	$Liquidity_{i,t-1}$	-0.01179***	$Liquidity_{i,t-1}$	-0.09525
	(-5.6)		(-14.95)		(-0.77)
$Profit_{i,t-1}$	-0.00103	$Profit_{i,t-1}$	-0.00173***	$Profit_{i,t-1}$	-0.91620***
	(-0.99)		(-2.55)		(-48.33)
$Dividends_{i,t-1}$	-0.00848	$Dividends_{i,t-1}$	-0.00034	$Dividends_{i,t-1}$	0.21961***
	(-0.78)		(-0.05)		(3.33)
$Earnings_{i,t-1}$	-0.00011	$Earnings_{i,t-1}$	-0.00005***	$Earnings_{i,t-1}$	0.00058**
	(-4.17)		(-2.78)		(2.11)
$Growth_{i,t-1}$	0.00009	$Growth_{i,t-1}$	0.00000	$Growth_{i,t-1}$	0.00030
	(3.15)		(-0.02)		(0.90)
$Tangibility_{i,t-1}$	0.00699	$Tangibility_{i,t-1}$	0.00036	$Tangibility_{i,t-1}$	0.03665*
	(6.09)		(0.49)		(1.76)
$NDTS_{i,t-1}$	-0.01941	$NDTS_{i,t-1}$	-0.00636	$NDTS_{i,t-1}$	-0.11088***
	(-2.57)		(-1.29)		(-2.38)
Adj R-square			0.0926		
N			376,821		
$\Delta Y_{i,t}\|OR^{U}_{i,t+1}$	-0.01333	$\Delta Y_{i,t}\|(\Delta Ldet_{i,t}\|OR^{U}_{i,t+1})$	-0.00114	$\Delta Y_{i,t}\|(\Delta Sdet_{i,t}\|OR^{U}_{i,t+1})$	-0.01219
$\Delta Y_{i,t}\|OR^{D}_{i,t+1}$	-0.02751	$\Delta Y_{i,t}\|(\Delta Ldet_{i,t}\|OR^{D}_{i,t+1})$	-0.00504	$\Delta Y_{i,t}\|(\Delta Sdet_{i,t}\|OR^{D}_{i,t+1})$	-0.02247

Table 5.14 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta ROA_{i,t+1}$	
Intercept	0.00387***	*Intercept*	0.00686***	*Intercept*	-0.01711***
	(5.67)		(15.48)		(-11.16)
$OR^U{}_{i,t+1}$	0.00054	$OR^U{}_{i,t+1}$	0.00271	$\Delta Ldet_{i,t}$	1.76073***
	(0.22)		(1.64)		(30.26)
$OR^D{}_{i,t+1}$	0.00620***	$OR^D{}_{i,t+1}$	0.00860***	$\Delta Sdet_{i,t}$	-2.17103***
	(3.23)		(6.66)		(-26.60)
$Leverage_{i,t-1}$	-0.00456***	$Leverage_{i,t-1}$	-0.01199***	$Leverage_{i,t}$	-0.04828***
	(-4.13)		(-16.76)		(-19.26)
$Size_{i,t-1}$	-0.00103***	$Size_{i,t-1}$	-0.00065***	$Size_{i,t}$	0.00888***
	(-7.49)		(-7.24)		(31.49)
$Price_{i,t-1}$	0.00168***	$Price_{i,t-1}$	0.00101***	$Price_{i,t}$	0.00480***
	(7.86)		(7.23)		(10.99)
$Liquidity_{i,t-1}$	-0.00742***	$Liquidity_{i,t-1}$	-0.01247***	$Liquidity_{i,t}$	-0.04561***
	(-5.92)		(-15.33)		(-15.49)
$Profit_{i,t-1}$	0.01490***	$Profit_{i,t-1}$	-0.00733***	$Profit_{i,t}$	-0.92997***
	(14.74)		(-10.79)		(-721.12)
$Dividends_{i,t-1}$	0.00631	$Dividends_{i,t-1}$	-0.00455	$Dividends_{i,t}$	0.17525***
	(1.49)		(-1.59)		(12.12)
$Earnings_{i,t-1}$	-0.00074***	$Earnings_{i,t-1}$	-0.00021***	$Earnings_{i,t}$	0.00501***
	(-11.59)		(-5.04)		(41.01)
$Growth_{i,t-1}$	0.00010***	$Growth_{i,t-1}$	-0.00003	$Growth_{i,t}$	0.00007
	(3.82)		(-1.55)		(1.35)
$Tangibility_{i,t-1}$	0.00807***	$Tangibility_{i,t-1}$	-0.00009	$Tangibility_{i,t}$	0.01021***
	(6.83)		(-0.12)		(4.13)
$NDTS_{i,t-1}$	-0.02014***	$NDTS_{i,t-1}$	-0.00559	$NDTS_{i,t}$	-0.03304**
	(-2.59)		(-1.11)		(-2.08)
Adj R-square			0.5624		
N			357,963		
$\Delta Y_{i,t+1}\|OR^U_{i,t+1}$	-0.00493	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	0.00095	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	-0.00588
$\Delta Y_{i,t+1}\|OR^D_{i,t+1}$	-0.00775	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	0.01092***	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	-0.01867***

Table 5.14 *(continued)*

Panel C (τ = 2) One quarter after DCRC					
Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta ROA_{i,t+2}$	
Intercept	0.00447***	*Intercept*	0.00594***	*Intercept*	-0.00549
	(7.26)		(7.11)		(-1.53)
$OR^U{}_{i,t+1}$	0.00430*	$OR^U{}_{i,t+1}$	0.00204	$\Delta Ldet_{i,t}$	1.21403***
	(1.73)		(0.63)		(8.02)
$OR^D{}_{i,t+1}$	0.01361***	$OR^D{}_{i,t+1}$	0.00355	$\Delta Sdet_{i,t}$	-2.03472***
	(7.05)		(1.40)		(-7.98)
$Leverage_{i,t-1}$	-0.00579***	$Leverage_{i,t-1}$	-0.00856***	$Leverage_{i,t+1}$	-0.02351***
	(-5.79)		(-6.29)		(-4.28)
$Size_{i,t-1}$	-0.00111***	$Size_{i,t-1}$	-0.00059***	$Size_{i,t+1}$	0.00667***
	(-8.81)		(-3.48)		(11.01)
$Price_{i,t-1}$	0.00192***	$Price_{i,t-1}$	0.00107***	$Price_{i,t+1}$	-0.00043
	(9.76)		(4.04)		(-0.45)
$Liquidity_{i,t-1}$	-0.00714***	$Liquidity_{i,t-1}$	-0.01385***	$Liquidity_{i,t+1}$	0.00016
	(-6.32)		(-9.05)		(0.02)
$Profit_{i,t-1}$	-0.00140	$Profit_{i,t-1}$	0.00260**	$Profit_{i,t+1}$	-0.85745***
	(-1.45)		(2.06)		(-107.79)
$Dividends_{i,t-1}$	0.00118	$Dividends_{i,t-1}$	-0.00393	$Dividends_{i,t+1}$	0.15881***
	(0.28)		(-0.71)		(4.97)
$Earnings_{i,t-1}$	0.00005	$Earnings_{i,t-1}$	-0.00058	$Earnings_{i,t+1}$	0.01396***
	(1.23)		(-10.29)		(54.11)
$Growth_{i,t-1}$	0.00006***	$Growth_{i,t-1}$	0.00001	$Growth_{i,t+1}$	-0.00073***
	(2.32)		(0.19)		(-2.53)
$Tangibility_{i,t-1}$	0.00662***	$Tangibility_{i,t-1}$	-0.00210	$Tangibility_{i,t+1}$	0.01121**
	(6.18)		(-1.44)		(2.12)
$NDTS_{i,t-1}$	-0.01532**	$NDTS_{i,t-1}$	0.00604	$NDTS_{i,t+1}$	-0.03475
	(-2.18)		(0.63)		(-1.04)
Adj R-square			0.0387		
N			339,093		
$\Delta Y_{i,t+2}\|OR^U_{i,t+1}$	0.00107	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	0.00522*	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	-0.00415
$\Delta Y_{i,t+2}\|OR^D_{i,t+1}$	0.00930	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	0.01652***	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	-0.00722

Table 5. 15 Long-term debt and short-term debt effects on changes in EPS

Values of estimated coefficients and their *t-statistic* for Equation (5.8a) (5.8b) and (5.8c) for non-financial firms. Y in (5.8c) is substituted as EPS Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic*. Rating changes take place at quarter *t+1*. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{U}_{i,t+1})$ is change in EPS due to adjustment in long-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{D}_{i,t+1})$ is change in EPS due to adjustment in long-term debt financing when downgrade is anticipated $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{U}_{i,t+1})$ is change in EPS due to adjustment in short-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{D}_{i,t+1})$is change in EPS due to adjustment in short-term debt financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A (τ = 0)
One quarter before DCRC

Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta EPS_{i,t}$	
Intercept	0.00420***	*Intercept*	0.00739***	*Intercept*	0.07131
	(6.39)		(17.18)		(0.03)
$OR^{U}{}_{i,t+1}$	0.00236	$OR^{U}{}_{i,t+1}$	0.00172	$\Delta Ldet_{i,t}$	-10.8236
	(0.90)		(1.00)		(-0.12)
$OR^{D}{}_{i,t+1}$	0.01437***	$OR^{D}{}_{i,t+1}$	0.00376***	$\Delta Sdet_{i,t}$	-13.50470
	(6.97)		(2.78)		(-0.04)
$Leverage_{i,t-1}$	-0.00115***	$Leverage_{i,t-1}$	-0.00054***	$Leverage_{i,t-1}$	-0.03145
	(-4.45)		(-16.58)		(-0.01)
$Size_{i,t-1}$	-0.00115***	$Size_{i,t-1}$	-0.00054***	$Size_{i,t-1}$	-0.03145
	(-8.65)		(-6.18)		(-0.39)
$Price_{i,t-1}$	0.00208***	$Price_{i,t-1}$	0.00049***	$Price_{i,t-1}$	0.08647
	(10.03)		(3.60)		(1.58)
$Liquidity_{i,t-1}$	-0.00678***	$Liquidity_{i,t-1}$	-0.01180***	$Liquidity_{i,t-1}$	-0.26447
	(-5.62)		(-14.95)		(-0.08)
$Profit_{i,t-1}$	-0.00100	$Profit_{i,t-1}$	-0.00173***	$Profit_{i,t-1}$	-0.65939
	(-0.96)		(-2.55)		(-1.30)
$Dividends_{i,t-1}$	-0.00822	$Dividends_{i,t-1}$	-0.00033	$Dividends_{i,t-1}$	0.06074
	(-0.76)		(-0.05)		(0.04)
$Earnings_{i,t-1}$	-0.00011***	$Earnings_{i,t-1}$	-0.00005**	$Earnings_{i,t-1}$	-0.00187
	(-4.17)		(-2.78)		(-0.25)
$Growth_{i,t-1}$	0.00009***	$Growth_{i,t-1}$	0.00000	$Growth_{i,t-1}$	-0.00369
	(3.16)		(-0.02)		(-0.42)
$Tangibility_{i,t-1}$	0.00700***	$Tangibility_{i,t-1}$	0.00035	$Tangibility_{i,t-1}$	0.16843
	(6.11)		(0.47)		(0.31)
$NDTS_{i,t-1}$	-0.02053***	$NDTS_{i,t-1}$	-0.00642	$NDTS_{i,t-1}$	-2.04891*
	(-2.72)		(-1.30)		(-1.77)
Adj R-square			0.0021		
N			376,644		
$\Delta Y_{i,t}|OR^{U}_{i,t+1}$	-0.04877	$\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{U}_{i,t+1})$	-0.02554	$\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{U}_{i,t+1})$	-0.02323
$\Delta Y_{i,t}|OR^{D}_{i,t+1}$	-0.20631	$\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{D}_{i,t+1})$	-0.15554	$\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{D}_{i,t+1})$	-0.05078

Table 5.15 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta EPS_{i,t+1}$	
Intercept	0.00361***	*Intercept*	0.00702***	*Intercept*	-0.05045
	(5.25)		(15.72)		(-0.44)
$OR^U{}_{i,t+1}$	0.00272	$OR^U{}_{i,t+1}$	0.00153	$\Delta Ldet_{i,t}$	-13.42620***
	(0.98)		(0.85)		(-2.68)
$OR^D{}_{i,t+1}$	0.01582***	$OR^D{}_{i,t+1}$	0.00338***	$\Delta Sdet_{i,t}$	27.46567***
	(7.28)		(2.40)		(3.89)
$Leverage_{i,t-1}$	-0.00117***	$Leverage_{i,t-1}$	-0.00058***	$Leverage_{i,t}$	0.03565
	(-4.74)		(-16.14)		(-0.07)
$Size_{i,t-1}$	-0.00117***	$Size_{i,t-1}$	-0.00058***	$Size_{i,t}$	0.03565*
	(-8.32)		(-6.32)		(1.67)
$Price_{i,t-1}$	0.00238***	$Price_{i,t-1}$	0.00062***	$Price_{i,t}$	-0.10757***
	(10.93)		(4.38)		(-3.21)
$Liquidity_{i,t-1}$	-0.00817***	$Liquidity_{i,t-1}$	-0.01210***	$Liquidity_{i,t}$	0.36492
	(-6.48)		(-14.79)		(1.66)
$Profit_{i,t-1}$	0.00227**	$Profit_{i,t-1}$	-0.00043	$Profit_{i,t}$	-0.21383*
	(2.01)		(-0.59)		(-1.84)
$Dividends_{i,t-1}$	-0.00116	$Dividends_{i,t-1}$	-0.00044	$Dividends_{i,t}$	0.56340
	(-0.24)		(-0.14)		(0.43)
$Earnings_{i,t-1}$	-0.00065	$Earnings_{i,t-1}$	-0.00026***	$Earnings_{i,t}$	0.01173
	(-10.00)		(-6.09)		(1.25)
$Growth_{i,t-1}$	0.00007***	$Growth_{i,t-1}$	-0.00001	$Growth_{i,t}$	0.00219
	(2.35)		(-0.52)		(0.51)
$Tangibility_{i,t-1}$	0.00689***	$Tangibility_{i,t-1}$	0.00052	$Tangibility_{i,t}$	0.17550
	(5.80)		(0.67)		(0.95)
$NDTS_{i,t-1}$	-0.01930***	$NDTS_{i,t-1}$	-0.00618	$NDTS_{i,t}$	-0.51401
	(-2.46)		(-1.21)		(-0.43)
Adj R-square			0.0026		
N			357,777		
$\Delta Y_{i,t+1}\|OR^U_{i,t+1}$	0.00550	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	-0.03652	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	0.04202
$\Delta Y_{i,t+1}\|OR^D_{i,t+1}$	-0.11957	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	-0.21240***	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	0.09283***

Table 5.15 *(continued)*

Panel C (τ = 2) One quarter after DCRC					
Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta EPS_{i,t+2}$	
Intercept	0.00404***	*Intercept*	0.00714***	*Intercept*	-0.11149
	(6.55)		(8.51)		(-0.81)
$OR^U{}_{i,t+1}$	0.00440*	$OR^U{}_{i,t+1}$	0.00183	$\Delta Ldet_{i,t}$	-11.26620*
	(1.76)		(0.54)		(-1.89)
$OR^D{}_{i,t+1}$	0.01468***	$OR^D{}_{i,t+1}$	0.00110	$\Delta Sdet_{i,t}$	31.68777***
	(7.51)		(0.41)		(3.15)
$Leverage_{i,t-1}$	-0.00116***	$Leverage_{i,t-1}$	-0.00044***	$Leverage_{i,t+1}$	0.05215
	(-5.63)		(-6.69)		(-0.50)
$Size_{i,t-1}$	-0.00116***	$Size_{i,t-1}$	-0.00044***	$Size_{i,t+1}$	0.05215***
	(-9.17)		(-2.58)		(2.25)
$Price_{i,t-1}$	0.00218***	$Price_{i,t-1}$	0.00031	$Price_{i,t+1}$	-0.11381***
	(11.05)		(1.15)		(-3.13)
$Liquidity_{i,t-1}$	-0.00752***	$Liquidity_{i,t-1}$	-0.01271***	$Liquidity_{i,t+1}$	0.38463
	(-6.64)		(-8.25)		(1.52)
$Profit_{i,t-1}$	-0.00098	$Profit_{i,t-1}$	0.00146	$Profit_{i,t+1}$	-1.50205***
	(-1.01)		(1.11)		(-4.76)
$Dividends_{i,t-1}$	-0.00024	$Dividends_{i,t-1}$	0.00014	$Dividends_{i,t+1}$	0.68814
	(-0.06)		(0.02)		(0.54)
$Earnings_{i,t-1}$	-0.00011***	$Earnings_{i,t-1}$	-0.00013**	$Earnings_{i,t+1}$	0.02153**
	(-2.51)		(-2.23)		(2.13)
$Growth_{i,t-1}$	0.00007***	$Growth_{i,t-1}$	-0.00003	$Growth_{i,t+1}$	0.01441
	(2.82)		(-0.88)		(1.27)
$Tangibility_{i,t-1}$	0.00661***	$Tangibility_{i,t-1}$	-0.00189	$Tangibility_{i,t+1}$	0.22136
	(6.16)		(-1.30)		(1.10)
$NDTS_{i,t-1}$	-0.01663***	$NDTS_{i,t-1}$	0.00910	$NDTS_{i,t+1}$	-0.47429
	(-2.36)		(0.95)		(-0.37)
Adj R-square			0.0014		
N			338,928		
$\Delta Y_{i,t+2}\|OR^U_{i,t+1}$	0.00842	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	-0.04957*	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	0.05799
$\Delta Y_{i,t+2}\|OR^D_{i,t+1}$	-0.13053	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	-0.16539*	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	0.03486

Table 5. 16 Long-term debt and short-term debt effects on changes in Tobin's Q

Values of estimated coefficients and their *t-statistic* for Equation (5.8a) (5.8b) and (5.8c) for non-financial firms. Y in (5.8c) is substituted as Tobin's Q. Estimated parameters on rating indicators describe influences of delayed credit rating changes on financing plan making one period before rating changes. The numbers in brackets underneath coefficient estimates are *t-statistic.* Rating changes take place at quarter *t+1*. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{U}_{i,t+1})$ is change in Tobin's Q due to adjustment in long-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Ldet_{i,t}|OR^{D}_{i,t+1})$ is change in Tobin's Q due to adjustment in long-term debt financing when downgrade is anticipated $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{U}_{i,t+1})$ is change in Tobin's Q due to adjustment in short-term debt financing when upgrade is anticipated. $\Delta Y_{i,t}|(\Delta Sdet_{i,t}|OR^{D}_{i,t+1})$is change in Tobin's Q due to adjustment in short-term debt financing when downgrade is anticipated. *, **, *** indicate statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A (τ = 0)
One quarter before DCRC

Equation (a) $\Delta Ldet_{i,t}$		Equation (b) $\Delta Sdet_{i,t}$		Equation (c) $\Delta TobinQ_{i,t}$	
Intercept	0.00399***	*Intercept*	0.00738***	*Intercept*	0.53176
	(6.06)		(16.95)		(0.25)
$OR^{U}{}_{i,t+1}$	0.00323	$OR^{U}{}_{i,t+1}$	0.00207	$\Delta Ldet_{i,t}$	-8.91455
	(1.24)		(1.20)		(-0.07)
$OR^{D}{}_{i,t+1}$	0.01255***	$OR^{D}{}_{i,t+1}$	0.00431***	$\Delta Sdet_{i,t}$	53.11380
	(6.00)		(3.11)		(0.15)
$Leverage_{i,t-1}$	-0.00110***	$Leverage_{i,t-1}$	-0.00057***	$Leverage_{i,t-1}$	-0.17306
	(-4.04)		(-16.45)		(0.13)
$Size_{i,t-1}$	-0.00110***	$Size_{i,t-1}$	-0.00057***	$Size_{i,t-1}$	-0.17306***
	(-8.21)		(-6.45)		(-2.48)
$Price_{i,t-1}$	0.00199***	$Price_{i,t-1}$	0.00054***	$Price_{i,t-1}$	0.28600***
	(9.57)		(3.94)		(3.80)
$Liquidity_{i,t-1}$	-0.00613***	$Liquidity_{i,t-1}$	-0.01189***	$Liquidity_{i,t-1}$	1.11435
	(-5.07)		(-14.87)		(0.32)
$Profit_{i,t-1}$	-0.00146	$Profit_{i,t-1}$	-0.00203***	$Profit_{i,t-1}$	5.62497***
	(-1.38)		(-2.91)		(10.18)
$Dividends_{i,t-1}$	-0.00899	$Dividends_{i,t-1}$	0.00292	$Dividends_{i,t-1}$	-1.74238
	(-0.80)		(0.39)		(-0.67)
$Earnings_{i,t-1}$	-0.00009***	$Earnings_{i,t-1}$	-0.00004***	$Earnings_{i,t-1}$	-0.25231***
	(-3.63)		(-2.56)		(-50.67)
$Growth_{i,t-1}$	0.00007***	$Growth_{i,t-1}$	0.00000	$Growth_{i,t-1}$	-0.58463***
	(2.60)		(-0.24)		(-53.53)
$Tangibility_{i,t-1}$	0.00655***	$Tangibility_{i,t-1}$	0.00040	$Tangibility_{i,t-1}$	0.27892
	(5.69)		(0.53)		(0.40)
$NDTS_{i,t-1}$	-0.01692***	$NDTS_{i,t-1}$	-0.00670	$NDTS_{i,t-1}$	-3.09666***
	(-2.24)		(-1.34)		(-2.93)
Adj R-square			0.1037		
N			365,724		
$\Delta Y_{i,t}\|OR^{U}_{i,t+1}$	0.08115	$\Delta Y_{i,t}\|(\Delta Ldet_{i,t}\|OR^{U}_{i,t+1})$	-0.02879	$\Delta Y_{i,t}\|(\Delta Sdet_{i,t}\|OR^{U}_{i,t+1})$	0.10995
$\Delta Y_{i,t}\|OR^{D}_{i,t+1}$	0.11704	$\Delta Y_{i,t}\|(\Delta Ldet_{i,t}\|OR^{D}_{i,t+1})$	-0.11188	$\Delta Y_{i,t}\|(\Delta Sdet_{i,t}\|OR^{D}_{i,t+1})$	0.22892

Table 5.16 *(continued)*

Panel B (τ = 1) **In the quarter of DCRC**					
Equation (a)		Equation (b)		Equation (c)	
$\Delta Ldet_{i,t}$		$\Delta Sdet_{i,t}$		$\Delta TobinQ_{i,t+1}$	
Intercept	0.00284***	*Intercept*	0.00735***	*Intercept*	1.07821***
	(4.15)		(16.38)		(46.94)
$OR^U{}_{i,t+1}$	0.00312	$OR^U{}_{i,t+1}$	0.00129	$\Delta Ldet_{i,t}$	16.19102***
	(1.19)		(0.75)		(16.32)
$OR^D{}_{i,t+1}$	0.01197***	$OR^D{}_{i,t+1}$	0.00486***	$\Delta Sdet_{i,t}$	-22.62450***
	(5.70)		(3.51)		(-16.91)
$Leverage_{i,t-1}$	-0.00108***	$Leverage_{i,t-1}$	-0.00061***	$Leverage_{i,t}$	-0.21851***
	(-3.69)		(-16.75)		(-7.57)
$Size_{i,t-1}$	-0.00108***	$Size_{i,t-1}$	-0.00061***	$Size_{i,t}$	-0.21851***
	(-7.73)		(-6.67)		(-51.07)
$Price_{i,t-1}$	0.00213***	$Price_{i,t-1}$	0.00073***	$Price_{i,t}$	0.42829***
	(9.84)		(5.13)		(64.44)
$Liquidity_{i,t-1}$	-0.00728***	$Liquidity_{i,t-1}$	-0.01227***	$Liquidity_{i,t}$	0.84378***
	(-5.79)		(-14.88)		(19.13)
$Profit_{i,t-1}$	0.00056	$Profit_{i,t-1}$	0.00050	$Profit_{i,t}$	-0.29233***
	(0.51)		(0.69)		(-13.59)
$Dividends_{i,t-1}$	-0.00671	$Dividends_{i,t-1}$	0.00091	$Dividends_{i,t}$	-0.32640
	(-0.76)		(0.16)		(-1.36)
$Earnings_{i,t-1}$	-0.00064***	$Earnings_{i,t-1}$	-0.00028***	$Earnings_{i,t+}$	-0.11527***
	(-9.90)		(-6.56)		(-61.28)
$Growth_{i,t-1}$	0.00027***	$Growth_{i,t-1}$	-0.00014***	$Growth_{i,t}$	-0.72280***
	(10.24)		(-8.14)		(-887.32)
$Tangibility_{i,t-1}$	0.00671***	$Tangibility_{i,t-1}$	0.00032	$Tangibility_{i,t}$	-0.04035
	(5.66)		(0.41)		(-1.09)
$NDTS_{i,t-1}$	-0.01388*	$NDTS_{i,t-1}$	-0.00738	$NDTS_{i,t}$	-3.21060***
	(-1.78)		(-1.44)		(-13.46)
Adj R-square			0.6844		
N			348,246		
$\Delta Y_{i,t+1}\|OR^U_{i,t+1}$	0.02133	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	0.05052	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	-0.02919
$\Delta Y_{i,t+1}\|OR^D_{i,t+1}$	0.08385***	$\Delta Y_{i,t+1}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	0.19381***	$\Delta Y_{i,t+1}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	-0.10996***

Table 5.16 *(continued)*

Panel C (τ = 2) One quarter after DCRC					
Equation (a)		Equation (b)		Equation (c)	
$\Delta Ldet_{i,t}$		$\Delta Sdet_{i,t}$		$\Delta TobinQ_{i,t+2}$	
Intercept	0.00398***	*Intercept*	0.00725***	*Intercept*	0.55124***
	(6.46)		(8.64)		(25.89)
$OR^U{}_{i,t+1}$	0.00459*	$OR^U{}_{i,t+1}$	0.00163	$\Delta Ldet_{i,t}$	5.27185***
	(1.84)		(0.48)		(5.70)
$OR^D{}_{i,t+1}$	0.01451***	$OR^D{}_{i,t+1}$	0.00121	$\Delta Sdet_{i,t}$	-3.62029***
	(7.45)		(0.45)		(-2.33)
$Leverage_{i,t-1}$	-0.00117***	$Leverage_{i,t-1}$	-0.00045***	$Leverage_{i,t+1}$	-0.09986***
	(-5.41)		(-6.87)		(-3.09)
$Size_{i,t-1}$	-0.00117***	$Size_{i,t-1}$	-0.00045***	$Size_{i,t+1}$	-0.09986***
	(-9.28)		(-2.63)		(-27.86)
$Price_{i,t-1}$	0.00217***	$Price_{i,t-1}$	0.00036	$Price_{i,t+1}$	0.19914***
	(11.05)		(1.33)		(35.39)
$Liquidity_{i,t-1}$	-0.00782***	$Liquidity_{i,t-1}$	-0.01247***	$Liquidity_{i,t+1}$	0.72091***
	(-6.91)		(-8.09)		(18.41)
$Profit_{i,t-1}$	-0.00160*	$Profit_{i,t-1}$	0.00215	$Profit_{i,t+1}$	-0.20040***
	(-1.66)		(1.64)		(-4.12)
$Dividends_{i,t-1}$	0.00016	$Dividends_{i,t-1}$	-0.00048	$Dividends_{i,t+1}$	-0.23581
	(0.04)		(-0.08)		(-1.20)
$Earnings_{i,t-1}$	-0.00011***	$Earnings_{i,t-1}$	-0.00013***	$Earnings_{i,t+1}$	-0.05534***
	(-2.55)		(-2.25)		(-35.4)
$Growth_{i,t-1}$	0.00014***	$Growth_{i,t-1}$	-0.00012***	$Growth_{i,t+1}$	-0.42292***
	(5.59)		(-3.47)		(-240.28)
$Tangibility_{i,t-1}$	0.00652***	$Tangibility_{i,t-1}$	-0.00187	$Tangibility_{i,t+1}$	0.03162
	(6.08)		(-1.28)		(1.01)
$NDTS_{i,t-1}$	-0.01550**	$NDTS_{i,t-1}$	0.00828	$NDTS_{i,t+1}$	-1.55323***
	(-2.20)		(0.86)		(-7.91)
Adj R-square			0.1645		
N			338,895		
$\Delta Y_{i,t+2}\|OR^U_{i,t+1}$	0.01830	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^U_{i,t+1})$	0.02420*	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^U_{i,t+1})$	-0.00590
$\Delta Y_{i,t+2}\|OR^D_{i,t+1}$	0.07211	$\Delta Y_{i,t+2}\|(\Delta Ldet_{i,t}\|OR^D_{i,t+1})$	0.07649***	$\Delta Y_{i,t+2}\|(\Delta Sdet_{i,t}\|OR^D_{i,t+1})$	-0.00438

Chapter VI

Conclusion

6.1 Thesis Overview and Concluding Remarks

A decade has passed since the Enron scandal in 2001, however, the scenarios of the credit rating changes given by the 'big three' rating agencies between 15th October 2001 to 2nd December 2001, when Enron went bankrupt, remain clear to market practitioners. The chronology of Enron's ratings change announced by the rating agency S&P during the two months before Enron's bankruptcy show that the changes in credit ratings were tardy and inaccurate. The credit ratings changes have always been delayed throughout the whole process. For instance, S&P affirmed Enron's BBB+ rating one day after its release of their earnings, announcing a $1.2 billion equity write down on the 15th October, 2001. The agency still affirmed the rating but only revised the outlook to negative. It only downgraded Enron's rating to CC and placed the rating on CreditWatch Negative on the 30th November, 2001, two days before Enron's bankruptcy and it lowered Enron's rating to junk level D following Enron's 2nd December, 2001 filing for bankruptcy protection.

Having faced denounces from the market, rating agencies have been throwing their efforts behind increasing the transparency of their rating process and criteria as well as improving the timeliness and accuracy of the announced credit ratings. For instance, S&P has developed a number of ways to publish its credit ratings, criteria, and research: press releases, websites [75], podcasts [76], newsletters (CreditMatters Today)[77], service desk, hosted events, direct contact with market participants and participation in industry and credit events (Standard & Poor's

[75] Websites listing credit rating related information are: www.standardandpoors.com, www.RatingsDirect.com, www.AboutCreditRatings.com and www.UnderstandingRatings.com.
[76] www.podcasts.standardandpoors.com.
[77] The newsletters are presented at www.standardandpoors.com/getcmt.

(2011)). It recently claimed in its updated publication 'Credit Rating Essentials' that the credit ratings it announced are forward looking, and based on firms' available current and historical information and assessment of the impacts of foreseeable future events (Standard & Poor's (2011)). However, during the past decade, following the Enron scandal, the phenomenon of rating changes' delay continuously appears, and this has motivated this research.

The introduction to this thesis noted that not only in industry but academics too have recently been highly sceptical of the preciseness and timeliness of credit ratings. However, not many of academics talk about utilising delays in credit rating changes as a source of favourable information for market insiders. Thus, the existing literature is limited in many areas. This research is motivated by the current insufficient research efforts towards the understanding of the importance of information asymmetry driven by delayed credit rating changes and the determinants of capital structures. Regarding the market insiders' practical perspective, unevenly distributed firm information between them and market outsiders as well as the delays in credit rating changes lead to unavoidable information asymmetry, which is favourable to them. Continuous efforts have been made to alleviate this asymmetry through regulatory bodies, such as the Sarbanes–Oxley Act of 2002[78], attempting to enforce prompt and accurate information dissemination. This thesis has examined the information value effects of the delayed credit rating changes on insider issuers' capital structures. Furthermore, it has suggested the mechanisms under which these effects work. Given the

[78] The Sarbanes–Oxley Act is a United States federal law enhanced in July 2002. It was enacted as a reaction to a number of major corporate and accounting scandals including those affecting Enron, Tyco International, Adelphia, Peregrine Systems and WorldCom. The act set new or enhanced standards for all U.S. public company boards, management and public accounting firms.

highlighted importance of DCRCs, this thesis has contributed to capital structure literature by introducing a significant information factor DCRC which has not been examined in previous research.

This thesis addresses three issues based on the introduction of the DCRC phenomenon in the reality of the current financial market. They are the influence of information asymmetry driven by DCRCs on capital structure and its working mechanism on the market, the added values on the existing theories to explain capital structure, and the adjustment in firm performance due to financing adjustments. The three distinct empirical chapters of this thesis, Chapter III, IV and V, make extensive contributions to the understanding of the above three issues.

6.1.1 Summary of Main Findings of Each Empirical Chapter

The first empirical chapter, Chapter III, addresses the delay in credit rating changes in the financial market and defines the concept to test its effects on capital structure. It explicitly investigates the influences of DCRCs on the market insider's financing adjustment. Based on the assumption that both the issuers and rating agencies are insiders, whose knowledge and predictions on next-period rating changes are more precise than those of outsiders, the main finding of the chapter is that DCRCs significantly affect issuer's capital structure decisions at least one period before the rating change takes place. The test result is based on the quarterly financial data of companies in North America and Standard & Poor's ratings data collected from Compustat for the period between Q1 1985 and Q4 2010. Adjusting firm's financing before rating changes is consistent with the hypothesis that the financing adjustment is due to information asymmetry before rating news is disclosed.

Firstly, consistent with the assumption (iv) made in Chapter III, the results of the chapter have suggested that issuers' rationality in estimating their future rating changes by combining their private information on updated firm financials with rating agencies' rating criteria as well as the potential communication with the agencies. As a result, issuers utilise their superior information, which is reflected by their financing adjustment behaviours before DCRC taking places. In particular, the result of the chapter shows that 'good' issuers moderately increase equity issuance by 0.901% (as the percentage of total asset in the last quarter) while 'bad' issuers significantly increase debt issuance by 1.809%. As a result, issuers take significant actions in adjusting their net debt issuance by 1.065% when they anticipate downgrades in the next quarter, but do not do so in responding to expected rating upgrades.[79] Furthermore, 'bad' issuers take actions on financing adjustment one quarter earlier than 'good' issuers.

Secondly, the evidence shows that issuers respond differently when they face changes in various credit ratings, for instance, they vary when facing the changes in long-term credit ratings and short-term credit ratings. In response to changes in long-term credit rating, 'good' issuers moderately increase equity issue by 0.894% (as the percentage of total asset in the last period) while 'bad' issuers significantly increase debt issue by 2.406%. Firms issue extra debt before a downgrade on long-term credit rating, consistent with the Hypothesis 3.2 that issuers take advantage of the relatively cheaper debt before downgrade. However, firms behave oppositely when they face a change in short-term credit rating. Issuers facing downgrade in short-term credit rating intend to save the rating by decreasing long-term debt one

[79] The evidence shows that financial and utility firms do not change their financing mix accordingly. It is consistent with the notion that the capital structure of financial firms is substantially influenced by regulators.

quarter before DCRCs, but firms do not take actions in financing before an upgrade in short-term credit ratings.

Thirdly, issuers' financing adjustments also depend on their static rating level before rating changes announced. The responses of firms to DCRCs vary across rating categories. In general, speculative-grade issuers show greater responses than investment-grade firms on adjusting net debt issuance, which typically have a wider information gap between outsiders and themselves. Facing forthcoming upgrades on long-term credit ratings, investment-grade issuers reduce long-term debt, while speculative-grade issuers increase equity issuance, consistent with the notion that speculative-grade issuers are keen to signal good information prior to the release of rating upgrade. Both investment-grade and speculative-grade issuers increase debt issuance before a downgrade on long-term credit ratings.

Overall, the findings of the chapter suggests that firms make financing decisions *before* the anticipated rating changes in order to benefit from the information asymmetry derived by DCRCs.

Having found DCRCs' effects on issuer's capital structure adjustments, the second empirical chapter, Chapter IV, mainly extends Chapter III in two aspects. Firstly, it confirms the DCRCs' effects by conducting various checks of robustness. The robustness tests show that outliers do not contaminate the results gained from ordinary regression methods. Secondly, it shows that the tests incorporating DCRC dummies into tests of existing capital structure theories have been conducted and they further confirm the DCRC's material effects on insiders. The test evidence shows that DCRC related hypotheses could be incorporated into the existing capital

structure theories, particularly the theories which are based on strong assumption of information asymmetry. DCRC thus cannot be easily nested into the Trade-off Theory, which lies in the tax benefit hypothesis. The added explanatory power on financing strategy driven by DCRCs is shown when DCRC dummies are incorporated into the tests of the Pecking Order Theory and the Market Timing Theory.

Based on the affirmed DCRC effect and its added value to the existing literature, the third empirical chapter, Chapter V, tests the changes in issuer's firm performance due to DCRC caused financing adjustments through simultaneous equation systems. The data sample again includes all non-missing observations from quarterly Compustat North data from Q1 1985 to Q4 2010 and the Standard & Poor's ratings data. The tests in the chapter focus on the nonfinancial firms.

The primary finding of the third empirical chapter is that issuers do improve their firm performance through financing adjustments before DCRCs. In particular, the test results indicate that ROA in the quarter of DCRC increases by 0.0239% for 'bad' issuers who anticipate future rating downgrade and increase net debt issuance by 1.250% before downgrade news is announced. EPS in the quarter of DCRC increases by 1.805% for 'bad' issuers who increase net debt issuance by 1.245% before downgrade. Tobin's Q in the quarter of DCRC decreases but only at a subtle level. However, 'bad' issuers gain the increase of Tobin's Q one quarter after DCRC through debt financing while 'good' issuers gain this benefit through their equity financing.

The results robustly support the hypotheses that information gap between issuers and outsiders driven by DCRCs contains value and affects issuers' financing strategy in many aspects. Firstly, the evidence shows that firms adjust debt and equity issuances one-period before rating changes. This is consistent with the results in the previous chapters. More specifically, 'good' issuers do not significantly adjust net debt issuance while 'bad' issuers significantly increase net debt issuance. Secondly, debt financing before DCRCs always seems to bring some temporary improvement in ROA and EPS. Yet, its influences on Tobin's Q transfer from negative to positive. Thirdly, equity financing generally does not bring significant improvement on ROA and EPS, but on Tobin's Q. Fourthly, long-term debt financing brings improvements on ROA and Tobin's Q and short-term debt brings negative changes in these two measures, whilst short-term debt bring positive changes in EPS for issuers.

6.1.2 Contributions and Implications of the Findings

This thesis addresses inherent factors in the financial market related to the information transmission mechanism, which is given by credit ratings. The findings of this thesis can facilitate market insiders to balance the relationship between gaining cheaper financing and keeping satisfactory rating grades. It also sheds light on regulating the financial market, credit rating industry and rating agencies by serving policy makers to better understand the motivation of fund seekers before their rating changes take place as well as the financing behaviours employed by market insiders when they own superior information. In addition to the contributions made to corporation organizations which seek external financing opportunities, the market outsiders can also boost their benefits or avoid loss by

improving their understanding on market insiders. The four main contributions are outlined below.

Firstly, the new concept of 'delays in credit rating changes' is well defined and the dummies described the delays of rating changes are used as a proxy of information asymmetry in the tests of this thesis. This allows the quantification of the length of time gap between issuers' processes of private information about future rating changes and the rating changes announced on the public financial market, and thus the efficiency on testing DCRC's influence on capital structures. This research develops the awareness of significant impacts of DCRCs on the market.

Secondly, to my best knowledge, the effects of changes in different types of credit ratings have not been studied in previous literature. Instead of focusing on the long-term credit rating only, Chapter III in this study investigates the effects from four types of ratings. It found that issuers behave differently when they face changes in different individual rating indicators due to the ratings' different characteristics and functions. Issuers thus have to choose between keeping the rating and getting cheaper finance. An significant difference between issuers' reaction when facing long-term credit rating and short-term credit rating is that issuers choose to get cheaper finance before long-term rating downgrades but choose to keep the rating before short-term rating downgrades.

Thirdly, this study incorporates DCRC into the existing capital structure theory. DCRC has added values when imbedded into tests examining existing capital structure theories. The results are explained most naturally by the theories which

consider the influences of information asymmetry, which further confirms the influences of the information asymmetry on fund seekers' financing behaviour.

Fourthly, further efforts made on testing the firm performance measures help to better understand the genuine impacts of DCRCs on issuers' financial conditions. The investors, if understand issuers' financing adjustment strategy well and accurately anticipate the changes of firm performance, could avoid confusing signals made by insiders and thus stay away from serious investment mistakes.

The implications of the study results could be employed by both academia and practitioners. Regarding the theoretical perspectives, the DCRC's significant impact is confirmed by being nested into some existing capital structure theories. It especially partially fits into the Pecking Order Theory which is based on the assumption of information asymmetry and the Market Timing Theory which is based on the assumption that market players are motivated to time the market and possess the capability to time the market accurately with their private information. Financial researchers, examining the information asymmetry and capital structure theories, form another group of beneficiaries of this thesis. In particular, it further confirms Myers (2001)'s view that there is no reason to expect one universal capital structure theory due to various and complex developed financial market environments.

Regarding the practical perspective, market insiders could learn from the evidential results that whether and when to utilise delayed rating changes and how to adjust financing before rating changes to gain some cheaper external funding as well as not bring negative impact on their credit ratings. The explicit results give

detailed suggestions through testing the effects of delay in long-term and short-term credit rating changes, the strategy when facing delayed upgrades and downgrades, the different approaches adjusting debt and equity issuances when issuers are in investment-grade and speculative-grade rating groups. In addition, the issuers' behaviour shown in this study sheds light on the regulation body's policy on the credit rating industry. Policy makers and advisors, who have to learn the market insiders' behaviours in a deeper level to draft regulations accordingly, can gain knowledge through this research.

6.2 Limitations and Areas for Future Research

Motivated by the increasing significant and profound influences of credit ratings on the financial market, this thesis studies the link between credit ratings and firms' financing plans. Despite rapidly increasing interest and effort, the existing study has been limited in a few aspects due to some measuring issues.

Effects of information asymmetry between market insiders and outsiders, in particular the difference of expectations on delayed rating changes between the fund seekers and other market players, on the adjustment of financing strategy are examined. This information content is regarded as favourable information utilised by issuers. This reaction is based on the premise that issuers receive their information earlier than outsiders. However, no suitable indicator has been introduced to measure the precise timing when issuers could have the information and knowledge to accurately forecast their future rating changes. Instead, issuers' realisation time is made mandatory in one or two quarters prior to the announcement in rating changes due to the difficulty of confirming indicators.

In addition, this study does not explicitly discuss DCRC's influence when outsiders could forecast the rating changes since the result based on data shows that outsiders could hardly catch the precise timing of rating changes even if they could forecast the static credit ratings according to publicly available firms' financial reports and rating agencies' rating criteria.

To summarise, this study concentrates on DCRC's role as an information asymmetry driven factor. The discussion focuses on choices of debt-equity issuances before DCRCs and firm performance improvements due to DCRCs. This thesis closes by highlighting four potential avenues for future research.

Firstly, tests in this study do not involve adjustments of rating's CreditWatch and Outlook as indicators of information asymmetry due to the limited access to relative historical data. An interesting future research direction could be to adapt these two rating related indicators into research[80]. Since CreditWatch and Outlook can disclose the information to the market outsiders and help them to understand the trend of future rating change, the information value of rating changes may be decreased by the two measures. Furthermore, since the endorsement value of rating will be tightly tied to the real rating change rather than the changes in CreditWatch or Outlook, there is a possibility to separately test information value and endorsement value. For instance, given a plausible assumption that information value has been fully disclosed by CreditWatch and Outlook and ratings only contains endorsement value after changes in CreditWatch or Outlook and before real rating change announced, the test is likely to discover the effects of

[80] The paper 'Credit Watch and Capital Structure' presented at the FMA annual meeting 2011 in Denver, U.S. has found that issuers increase debt issuance when the CreditWatch is negative, however, the paper does not examine the effects of delays in credit rating changes and does not find the rational explanation of the paper's findings.

endorsement value, though this is still not a perfect way of testing the two types of values.

Secondly, a large body of theoretical research has recognized debt heterogeneity (e.g., Diamond (1991, 1993), Park (2000), Bolton and Freixas (2000), and DeMarzo and Fishman (2007)). Rauf and Sufi (2009) further argue that debt heterogeneity is a first-order aspect of firm capital structure and find that debt structure varies across the credit-quality distribution. Nevertheless, this study only considered debt maturity and separately tested the functions of short-term debt and long-term debt to show that issuers seek for cheaper external funding. Debt is considered uniform and its heterogeneity is not counted in most studies. Since the division of debts is by their maturity rather than by risk scales[81], issuers' considerations on the volatility of debts are ignored in the research. Further research on debt types when investigate DCRC's effects may help to understand more detailed behaviours and the relative motivations behind them.

Thirdly, the transmission between credit rating changes and firm performance is not merely a one-way mechanism, but a two-way system. As discussed in this study, the transmission starts from DCRC and ends at firm performance. However, managers consider firm performance when they make financing plan. Rating agencies would consider issuer firms' key performance indicators and capital structure when they rate the issuers. This transmission from firm performance to DCRC is also conceivable and documented in literature. This study solely focuses on the effects of delays in rating changes on the firm performance indicators. It does not formally test the two-way causality between capital structure and firm

[81] Despite of debt maturity sometimes related to risk, it cannot fully describe the debt heterogeneity.

performance (in the last empirical chapter, Chapter V), and this leaves the question open. Designed tests can be carried out in a framework which allows interactions among these elements.

Last but not least, this study investigates the consequence of financing adjustments by testing firm performance improvements but not the market reaction. A follow up study would be the market reaction to a change in financing for a firm that previously had a financing adjustment prior to a rating change. For example, issuing extra debt would signal a future rating change and be met by a negative stock market reaction. Conversely, issuing more equity may signal an upgrade with a positive stock market reaction. Tests after a 'quiet' period could be conducted to better understand the issuers' behaviour. If rating data of Moody's and Fitch is available, interactive behaviours among issuers and rating agencies could be further investigated. The uncovered areas propose a direction for further research.

Appendices

Appendix 1 Estimation of DCRC's impacts on financing throughout periods around rating changes (Balanced dataset)

Values of estimated coefficients and their *t-statistic* of Equation (3.5a)-(3.5c). Estimated parameters on rating indicators indicate DCRC's influences on financing. The numbers in brackets underneath coefficient estimates are *t-statistic*. The four panels show the estimation results in the four periods around DCRC takes places. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

	Before rating changes						**After rating changes**					
	Panel A **Two quarters before rating changes (τ = -1)**			**Panel B** **One quarter before rating changes (τ = 0)**			**Panel C** **One quarter after rating changes (τ = 2)**			**Panel D** **Two quarters after rating changes (τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.00616**	0.00971***	0.01587***	-0.00760***	0.00896***	0.01656***	0.00145	0.00833***	0.00688***	0.00122	0.00811***	0.00689***
	(-2.11)	(9.64)	(6.71)	(-4.44)	(11.62)	(10.88)	(0.84)	(8.98)	(4.73)	(0.70)	(8.73)	(4.73)
OR^U	-0.00677	-0.00218	0.00459	0.00403	0.00990***	0.00587	0.00438	0.00729*	0.00291	-0.00112	0.00083	0.00195
	(-0.58)	(-0.54)	(0.49)	(0.59)	(3.22)	(0.97)	(0.63)	(1.95)	(0.50)	(-0.16)	(0.22)	(0.33)
OR^D	-0.01231	0.00798***	0.02028***	0.01372**	0.01822***	0.00450	0.0111**	0.01568***	0.00459	0.00200	0.00723***	0.00523
	(-1.28)	(2.40)	(2.60)	(2.44)	(7.17)	(0.90)	(2.03)	(5.35)	(0.99)	(0.36)	(2.46)	(1.14)
Leverage	-0.03062***	-0.01740***	0.01322***	-0.02601***	-0.01689***	0.00913***	-0.02709***	-0.01973***	0.00736***	-0.02666***	-0.01932***	0.00734***
	(-6.45)	(-10.62)	(3.44)	(-9.37)	(-13.48)	(3.69)	(-9.71)	(-13.23)	(3.15)	(-9.55)	(-12.95)	(3.14)
Size	0.00909***	-0.00140***	-0.01049***	0.00829***	-0.00125***	-0.00954***	0.00589***	-0.00096***	-0.00685***	0.00595***	-0.00090***	-0.00685***
	(15.04)	(-6.74)	(-21.44)	(23.18)	(-7.75)	(-29.97)	(16.14)	(-4.91)	(-22.40)	(16.30)	(-4.61)	(-22.40)
Price	-0.00944***	0.00307***	0.01251***	-0.00919***	0.00244***	0.01163***	-0.00562***	0.00239***	0.00801***	-0.00563***	0.00238***	0.00801***
	(-10.19)	(9.59)	(16.67)	(-16.99)	(9.99)	(24.15)	(-10.16)	(8.08)	(17.29)	(-10.18)	(8.05)	(17.29)
Liquidity	-0.01119**	-0.02313***	-0.01194***	-0.00179	-0.01771***	-0.01592***	-0.00450	-0.02099***	-0.01648***	-0.00429	-0.02079***	-0.01650***
	(-2.06)	(-12.32)	(-2.71)	(-0.56)	(-12.32)	(-5.61)	(-1.40)	(-12.16)	(-6.10)	(-1.33)	(-12.05)	(-6.10)
Profit	0.16456***	0.00425***	-0.16031***	0.14697***	-0.01207***	-0.15903***	0.11657***	-0.01685***	-0.13343***	0.11642***	-0.01699***	-0.13341***
	(37.80)	(2.83)	(-45.48)	(30.64)	(-5.58)	(-37.24)	(23.47)	(-6.35)	(-32.07)	(23.44)	(-6.40)	(-32.06)
Dividends	0.00881	0.00004	-0.00885	0.06646**	-0.00159	-0.06804***	0.07236***	-0.01153	-0.08389***	0.07223***	-0.01165	-0.08388***
	(0.49)	(-0.01)	(-0.60)	(2.22)	(-0.12)	(-2.55)	(2.88)	(-0.86)	(-3.99)	(2.88)	(-0.87)	(-3.99)
Earnings	0.00743***	-0.00078***	-0.00822***	0.00549***	-0.00066***	-0.00615***	0.00423***	-0.00104***	-0.00528***	0.00423***	-0.00105***	-0.00528***
	(23.59)	(-7.23)	(-32.21)	(32.86)	(-8.78)	(-41.37)	(25.38)	(-11.72)	(-37.77)	(25.35)	(-11.76)	(-37.78)
Growth	-0.00119***	0.00003	0.00122***	-0.00084***	0.00006***	0.00090***	-0.00423***	0.00664***	0.00489***	-0.00423***	0.00066***	0.00489***
	(-11.73)	(0.99)	(14.90)	(-13.87)	(2.33)	(16.76)	(-26.99)	(7.93)	(37.28)	(-26.98)	(7.94)	(37.28)
Tangibility	-0.0131***	0.00500***	0.01810***	-0.00990***	0.00579***	0.01569***	-0.01040***	0.00629***	0.01669***	-0.01026***	0.00645***	0.01671***
	(-2.58)	(2.85)	(4.40)	(-3.34)	(4.33)	(5.95)	(-3.49)	(3.95)	(6.68)	(-3.44)	(4.04)	(6.69)
NDTS	0.05848*	-0.01850	-0.07697***	0.04775***	-0.01315	-0.06090***	0.04398**	-0.01504	-0.05803***	0.04337**	-0.01471	-0.05808***
	(1.76)	(-1.62)	(-2.87)	(2.46)	(-1.50)	(-3.52)	(2.19)	(-1.43)	(-3.52)	(2.21)	(-1.40)	(-3.53)
Adj R-square	0.0579	0.0040	0.0881	0.0501	0.0064	0.0718	0.0459	0.0077	0.0812	0.0458	0.0074	0.0882
N	81,381	81,381	81,381	81,381	81,381	81,381	81,381	81,381	81,381	81,381	81,381	81,381

Appendix 1 *(Continued)* Sample summary statistics of the balanced dataset

The sample is drawn from quarterly Compustat data, excluding financial firms and utility firms and firm-quarters with negative equity values during the period Q1 1985 - Q4 2010. The statistics is based on the estimation samples of tests. Panel A lists summary statistics of dependant variables and control variables in the tests. Δdet is defined as long-term debt issuance minus long-term debt reduction plus changes in current debt and normalized by firms' total assets. Δeqt is defined as sale of common and preferred stock minus purchases of common and preferred stock and normalized by firm's total assets. Δnet is the defined as Δdet minus Δeqt. Other control variable definitions are *Leverage*: ratio of the sum of short-term debt (*Sd*) and long-term debt (*Ld*) to the sum of short-term debt, long-term debt, and stockholders' equity. *Size:* logarithm of sales. *Price***:** logarithm of the close price of the quarter. *Liquidity*: ratio of cash and cash equivalent divided (normalized) by total assets. *Profit***:** ratio of *EBITDA* to total assets. *Dividends*: ratio of dividends to total assets. *Earnings***:** ratio of retained earnings to total assets. *Growth***:** total debt book value plus quarterly close price multiply outstanding common stock shares and normalized by total assets. *Tangibility*: ratio of property plant and equipment (Net) to total assets. *NDTS*: ratio of deferred taxes and investment tax credit to total assets. Panel B lists firm characteristics by financing types. The four types are defined as: *Debt only* financing firms are those with positiveΔdet but non-positive Δeqt; *Equity only* financing firms are those with positive Δeqt but non-positive Δdet; *Dual* financing means both Δdet and Δeqt are positive and *Internal* financing is assumed if no issuance is made, which means both Δdet and Δeqt are both non-positive.

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	81,381	0.004	0.000	0.084	-1.414	11.164
Δeqt	81,381	0.011	0.000	0.137	-3.753	9.741
Δnet	81,381	-0.007	0.000	0.161	-9.741	11.164
$\Delta Sdet$	81,381	0.001	0.000	0.047	-1.414	2.612
$\Delta Ldet$	81,381	0.003	0.000	0.074	-1.813	11.164
Leverage	81,381	0.216	0.135	0.240	0.000	0.998
Size	81,381	3.369	3.287	2.450	-6.908	11.730
Price	81,381	1.980	2.224	1.535	-6.908	11.523
Liquidity	81,381	0.200	0.108	0.224	-0.023	1.000
Profit	81,381	0.011	0.025	0.119	-6.882	13.207
Dividends	81,381	0.003	0.000	0.022	-0.220	3.700
Earnings	81,381	-0.543	0.165	3.699	-330.363	2.319
Growth	81,381	1.829	1.168	3.712	0.003	499.018
Tangibility	81,381	0.254	0.189	0.225	0.000	0.998
NDTS	81,381	0.018	0.000	0.033	-0.013	0.368

Appendix 2 Estimation of DCRC's impacts on financing throughout periods around rating changes (Balanced dataset excluding outliers)

Values of estimated coefficients and their *t-statistic* of Equation (3.5a)-(3.5c). Estimated parameters on rating indicators indicate DCRC's influences on financing. The numbers in brackets underneath coefficient estimates are *t-statistic*. The four panels show the estimation results in the four periods around DCRC takes places. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes (τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.00125	0.00713***	0.00838***	0.00903***	0.01809***	0.00906***	0.00618***	0.01451***	0.00833***	0.00596***	0.01430***	0.00834***
	(-0.83)	(6.17)	(9.25)	(6.36)	(16.52)	(10.89)	(4.33)	(12.94)	(10.15)	(4.17)	(12.75)	(10.17)
OR^U	-0.00780*	-0.00592*	0.00189	0.00612	0.00912***	0.00300	0.00097	0.00201	0.00104	-0.00184	-0.00107	0.00078
	(-1.83)	(-1.80)	(0.73)	(1.54)	(2.97)	(1.29)	(0.24)	(0.62)	(0.44)	(-0.45)	(-0.33)	(0.33)
OR^D	0.0033	0.00855***	0.00525***	0.0137***	0.01532***	0.00162	0.01677***	0.01794***	0.00117	0.00596*	0.0082***	0.00224
	(0.88)	(2.95)	(2.31)	(3.90)	(5.65)	(0.79)	(5.10)	(6.95)	(0.62)	(1.83)	(3.20)	(1.20)
Leverage	-0.02049***	-0.01662***	0.00387***	-0.03346***	-0.03006***	0.00340***	-0.03763***	-0.03514***	0.00249**	-0.03719***	-0.03474***	0.00244*
	(-8.96)	(-9.48)	(2.81)	(-15.54)	(-18.10)	(2.70)	(-17.42)	(-20.72)	(2.01)	(-17.21)	(-20.47)	(1.97)
Size	0.00155***	-0.00108***	-0.00262***	0.00144***	-0.00094***	-0.00238***	0.00146***	-0.00072***	-0.00218***	0.00153***	-0.00065***	-0.00218***
	(5.62)	(-5.10)	(-15.86)	(5.60)	(-4.77)	(-15.84)	(5.70)	(-3.55)	(-14.77)	(5.96)	(-3.24)	(-14.80)
Price	0.0019***	0.00338***	0.00148***	0.00306***	0.00393***	0.00087***	0.00347***	0.00395***	0.00048*	0.00345***	0.00394***	0.000482
	(3.67)	(8.51)	(4.76)	(6.18)	(10.30)	(3.02)	(6.93)	(10.05)	(1.67)	(6.90)	(10.01)	(1.67)
Liquidity	-0.01154***	-0.02261***	-0.01107***	-0.00676***	-0.02041***	-0.01365***	-0.00443*	-0.01739***	-0.01295***	-0.00421*	-0.01718***	-0.01298***
	(-4.27)	(-10.91)	(-6.82)	(-2.67)	(-10.46)	(-9.21)	(-1.75)	(-8.72)	(-8.88)	(-1.66)	(-8.61)	(-8.89)
Profit	0.00751	-0.00536	-0.01287***	-0.03898***	-0.06734***	-0.02836***	0.04606***	0.0055	-0.04055***	0.04508***	0.00463	-0.04045***
	(1.43)	(-1.33)	(-4.07)	(-6.69)	(-14.97)	(-8.30)	(4.19)	(0.64)	(-6.42)	(4.10)	(0.54)	(-6.41)
Dividends	0.00359	0.00105	-0.00253	0.08226***	0.04028***	-0.04199***	0.06190***	0.01833	-0.04357***	0.06187***	0.01829	-0.04358***
	(0.59)	(0.23)	(-0.69)	(3.47)	(2.20)	(-3.02)	(2.58)	(0.97)	(-3.16)	(2.58)	(0.97)	(-3.16)
Earnings	0.00484***	-0.00320***	-0.00805***	-0.01844***	-0.02728***	-0.00885***	-0.02258***	-0.03221***	-0.00963***	-0.02261***	-0.03224***	-0.00963***
	(4.23)	(-3.64)	(-11.69)	(-16.27)	(-31.21)	(-13.33)	(-18.70)	(-33.97)	(-13.88)	(-18.72)	(-33.98)	(-13.88)
Growth	-0.00067	0.00024**	0.00091***	-0.00150***	0.00038**	0.00188***	-0.00226***	0.000656***	0.00291***	-0.00226***	0.00065***	0.00291***
	(-4.48)	(2.08)	(10.11)	(-6.39)	(2.09)	(13.65)	(-7.60)	(2.81)	(17.06)	(-7.62)	(2.79)	(17.06)
Tangibility	-0.00358	0.00448***	0.00806***	-0.00245	0.00421***	0.00666***	0.00155	0.00771***	0.00616***	0.0017	0.00787***	0.00616***
	(-1.55)	(2.53)	(5.82)	(-1.14)	(2.54)	(5.29)	(0.72)	(4.59)	(5.01)	(0.80)	(4.68)	(5.01)
NDTS	0.02027	-0.01111	-0.03138***	0.02005*	-0.00233	-0.02238***	0.01454	0.00235	-0.01219*	0.01489	0.00268	-0.01221*
	(1.57)	(-1.12)	(-4.04)	(1.66)	(-0.25)	(-3.16)	(1.21)	(0.25)	(-1.76)	(1.23)	(0.28)	(-1.76)
Adj R-square	0.0056	0.0055	0.0144	0.0115	0.0254	0.0178	0.0150	0.0311	0.0195	0.0145	0.0303	0.0195
N	75,687	75,687	75,687	75,687	75,687	75,687	75,687	75,687	75,687	75,687	75,687	75,687

Appendix 2 *(Continued)* **Sample summary statistics of the balanced dataset (excluding outliers)**

The sample is drawn from quarterly Compustat data, excluding financial firms and utility firms and firm-quarters with negative equity values during the period Q1 1985 - Q4 2010. The statistics is based on the estimation samples of tests. Panel A lists summary statistics of dependant variables and control variables in the tests. Δdet is defined as long-term debt issuance minus long-term debt reduction plus changes in current debt and normalized by firms' total assets. Δeqt is defined as sale of common and preferred stock minus purchases of common and preferred stock and normalized by firm's total assets. Δnet is the defined as Δdet minus Δeqt. Other control variable definitions are *Leverage*: ratio of the sum of short-term debt (*Sd*) and long-term debt (*Ld*) to the sum of short-term debt, long-term debt, and stockholders' equity. *Size:* logarithm of sales. *Price***:** logarithm of the close price of the quarter. *Liquidity*: ratio of cash and cash equivalent divided (normalized) by total assets. *Profit***:** ratio of *EBITDA* to total assets. *Dividends*: ratio of dividends to total assets. *Earnings***:** ratio of retained earnings to total assets. *Growth***:** total debt book value plus quarterly close price multiply outstanding common stock shares and normalized by total assets. *Tangibility*: ratio of property plant and equipment (Net) to total assets. *NDTS*: ratio of deferred taxes and investment tax credit to total assets. Panel B lists firm characteristics by financing types. The four types are defined as: *Debt only* financing firms are those with positiveΔdet but non-positive Δeqt; *Equity only* financing firms are those with positive Δeqt but non-positive Δdet; *Dual* financing means both Δdet and Δeqt are positive and *Internal* financing is assumed if no issuance is made, which means both Δdet and Δeqt are both non-positive.

Variables	N	Mean	Median	Std Dev	Minimum	Maximum
Δdet	75,687	0.003	0.000	0.061	-0.907	2.677
Δeqt	75,687	-0.001	0.000	0.045	-0.612	3.048
Δnet	75,687	0.004	0.000	0.077	-3.048	2.612
$\Delta Sdet$	75,687	0.000	0.000	0.041	-0.908	2.612
$\Delta Ldet$	75,687	0.002	0.000	0.047	-0.502	2.681
Leverage	75,687	0.217	0.171	0.220	0.000	0.992
Size	75,687	4.423	4.348	2.085	-5.809	11.730
Price	75,687	2.742	2.890	1.070	-4.962	11.505
Liquidity	75,687	0.163	0.086	0.184	0.000	0.982
Profit	75,687	0.042	0.039	0.030	0.000	0.503
Dividends	75,687	0.004	0.000	0.016	0.000	0.863
Earnings	75,687	0.378	0.343	0.243	0.000	2.541
Growth	75,687	1.599	1.194	1.396	0.019	52.319
Tangibility	75,687	0.279	0.227	0.213	0.000	0.986
NDTS	75,687	0.024	0.01	0.036	-0.013	0.317

Appendix 3 Estimation of DCRC's impacts on financing throughout periods around rating changes (Utility firms)

Values of estimated coefficients and their *t-statistic* of Equation (3.5). Estimated parameters on rating indicators indicate DCRC's influences on financing. The numbers in brackets underneath coefficient estimates are *t-statistic.* The four panels show the estimation results in the four periods around DCRC takes places. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively. The coefficients on rating indicators are not significant in any of the four time periods, indicating that DCRCs do not bring significant effects to utility firms' financing.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes (τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	0.28517***	0.00655	-0.07372**	0.00641	0.01591***	-0.00303	0.00390	0.01706***	0.00499***	0.00374	0.01698***	0.00501***
	(3.35)	(1.09)	(-2.01)	(1.24)	(3.69)	(-1.30)	(0.85)	(4.31)	(2.80)	(0.82)	(4.29)	(2.81)
OR^U	-0.00004	0.00323	-0.00277	0.00673	0.00667	0.00387	-0.0038	-0.00302	-0.00277	0.01094	0.00953	0.00157
	(0.00)	(0.29)	(-0.04)	(0.67)	(0.8)	(0.85)	(-0.40)	(-0.37)	(-0.80)	(1.23)	(1.25)	(0.50)
OR^D	0.00448	0.00349	-0.00190	0.00943	0.00949	-0.00566	0.00751	0.00765	0.00300	0.00111	0.00419	0.00213
	(0.04)	(0.39)	(-0.03)	(1.26)	(1.51)	(-1.59)	(1.10)	(1.30)	(1.12)	(0.17)	(0.74)	(0.84)
Leverage	-0.22382**	-0.02743***	0.04436	-0.02759***	-0.01667***	-0.00489*	-0.01816***	-0.01123**	0.01104***	-0.01815***	-0.0114***	0.01093***
	(-2.12)	(-3.66)	(0.97)	(-4.33)	(-3.10)	(-1.69)	(-3.09)	(-2.22)	(5.03)	(-3.08)	(-2.25)	(4.98)
Size	-0.02037*	0.00016	0.00603	0.00014	-0.00151***	-0.00008	0.00038	-0.00157***	-0.00248***	0.000396	-0.00156***	-0.00248***
	(-1.71)	(0.19)	(1.08)	(0.19)	(-2.47)	(-0.21)	(0.57)	(-2.76)	(-9.18)	(0.60)	(-2.75)	(-9.22)
Price	0.08496***	0.00467***	-0.01605	0.00562***	0.00340***	0.00332***	0.00345***	0.00265***	-0.00133***	0.00340***	0.00261***	-0.00135***
	(3.96)	(3.05)	(-1.70)	(4.35)	(3.12)	(5.58)	(3.01)	(2.66)	(-3.00)	(2.97)	(2.62)	(-3.05)
Liquidity	-0.68793***	-0.01886	0.40796***	-0.01151	-0.02548***	-0.01972***	-0.01446	-0.02079***	-0.00602	-0.01427	-0.02073***	-0.00605
	(-3.82)	(-1.47)	(5.01)	(-1.05)	(-2.76)	(-3.82)	(-1.45)	(-2.41)	(-1.54)	(-1.43)	(-2.41)	(-1.54)
Profit	-1.40642***	-0.03484***	0.04749***	-0.00061	-0.00675	-0.48361***	0.00278	-0.00944	-0.02413***	0.00271	-0.00949	-0.02415**
	(-10.53)	(-3.59)	(7.82)	(-0.08)	(-0.98)	(-1240.8)	(0.38)	(-1.45)	(-6.21)	(0.37)	(-1.46)	(-6.21)
Dividends	0.36344	0.03861	-0.01459	0.04392	0.00160	0.01178	0.28410***	0.14726	-0.09668**	0.28593***	0.14900	-0.09701***
	(0.33)	(0.48)	(-0.02)	(0.65)	(0.03)	(0.31)	(2.57)	(1.51)	(-2.22)	(2.58)	(1.53)	(-2.23)
Earnings	0.02297***	0.00023	-0.02686***	0.00064	0.00004	-0.00051***	-0.00007	0.00006	0.00050***	-0.00007	0.00006	0.00050***
	(4.01)	(0.54)	(-7.54)	(1.80)	(0.13)	(-2.23)	(-1.33)	(1.33)	(18.63)	(-1.33)	(1.33)	(18.63)
Growth	-0.11553***	0.00074	0.00751**	-0.00262***	0.00277***	0.00771***	-0.00136***	0.00097*	0.01006***	-0.00136***	0.00097*	0.01006***
	(-6.34)	(0.74)	(2.15)	(-2.50)	(3.95)	(34.48)	(-2.26)	(1.93)	(36.06)	(-2.27)	(1.92)	(36.04)
Tangibility	-0.09986	0.01144	0.03367	0.00306	0.00072	0.01217***	0.00236	0.00001	0.00065	0.00253	0.00020	0.00070
	(-0.99)	(1.59)	(0.80)	(0.50)	(0.14)	(4.56)	(0.42)	(0.00)	(0.32)	(0.45)	(0.04)	(0.35)
NDTS	-0.88805**	-0.10422***	0.24373	-0.08486***	-0.07855***	-0.03772***	-0.05991***	-0.07055***	-0.00792	-0.05952***	-0.07041***	-0.00762
	(-2.02)	(-3.32)	(1.28)	(-3.17)	(-3.46)	(-3.12)	(-2.43)	(-3.32)	(-0.87)	(-2.42)	(-3.31)	(-0.83)
Adj R-square	0.0168	0.0031	0.0062	0.0050	0.0045	0.9966	0.0028	0.0026	0.0694	0.0028	0.0027	0.0693
N	10,777	11,519	23,390	11,173	11,950	24,344	11,275	12,078	24,628	11,275	12,078	24,628

Appendix 4 Estimation of DCRC's impacts on financing throughout periods around rating changes (Financial firms)

Values of estimated coefficients and their *t-statistic* of Equation (3.5). Estimated parameters on rating indicators indicate DCRC's influences on financing. The numbers in brackets underneath coefficient estimates are *t-statistic*. The four panels show the estimation results in the four periods around DCRC takes places. *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively. The coefficients on rating indicators are not significant in any of the four time periods, indicating that DCRCs do not bring significant effects to financial firms' financing.

	Before rating changes						**After rating changes**					
	Panel A Two quarters before rating changes (τ = -1)			**Panel B One quarter before rating changes (τ = 0)**			**Panel C One quarter after rating changes (τ = 2)**			**Panel D Two quarters after rating changes (τ = 3)**		
	$\Delta net_{i,t-1}$	$\Delta det_{i,t-1}$	$\Delta eqt_{i,t-1}$	$\Delta net_{i,t}$	$\Delta det_{i,t}$	$\Delta eqt_{i,t}$	$\Delta net_{i,t+2}$	$\Delta det_{i,t+2}$	$\Delta eqt_{i,t+2}$	$\Delta net_{i,t+3}$	$\Delta det_{i,t+3}$	$\Delta eqt_{i,t+3}$
Intercept	-0.01186*	-0.00296	0.00992***	0.00201	0.00533*	0.00738***	-0.00005	0.00311	0.00593***	0.00002	0.00314	0.00589***
	(-1.77)	(-0.54)	(4.24)	(0.55)	(1.75)	(4.08)	(-0.01)	(1.04)	(3.91)	(0.00)	(1.05)	(3.88)
OR^U	-0.00628	-0.00748	0.00267	0.00691	0.00211	-0.00268	0.00611	0.00485	-0.00018	-0.00894	-0.0003	0.00826
	(-0.22)	(-0.32)	(0.27)	(0.4)	(0.15)	(-0.33)	(0.33)	(0.33)	(-0.03)	(-0.71)	(-0.03)	(1.61)
OR^D	-0.01273	-0.01018	0.00318	-0.00018	-0.0054	-0.00395	-0.00221	0.00155	0.0022	-0.00596	-0.00819	0.00012
	(-0.61)	(-0.61)	(0.42)	(-0.02)	(-0.56)	(-0.66)	(-0.18)	(0.16)	(0.43)	(-0.52)	(-0.88)	(0.03)
Leverage	-0.02807***	-0.01325*	0.00672**	-0.00372	0.00707*	0.00493*	-0.00628	0.00428	0.00502***	-0.00614	0.00446	0.00503***
	(-3.04)	(-1.76)	(2.06)	(-0.73)	(1.69)	(1.94)	(-1.25)	(1.04)	(2.35)	(-1.22)	(1.08)	(2.36)
Size	0.00447***	0.00133	-0.00375***	0.00161**	-0.00102*	-0.00283***	0.00181***	-0.00077	-0.00261***	0.00185***	-0.00071	-0.00262***
	(3.32)	(1.21)	(-7.96)	(2.18)	(-1.66)	(-7.77)	(2.50)	(-1.28)	(-8.55)	(2.55)	(-1.19)	(-8.58)
Price	0.00479**	0.00532***	0.00259***	-0.0003	0.00191**	0.00228***	0.000311	0.00244***	0.00208***	0.000306	0.00242***	0.00207***
	(2.12)	(2.85)	(3.38)	(-0.24)	(1.85)	(3.86)	(0.26)	(2.43)	(4.23)	(0.25)	(2.41)	(4.22)
Liquidity	0.01092	-0.00027	-0.01230***	-0.01308**	-0.01705***	-0.01097***	-0.01236*	-0.01662***	-0.00891***	-0.01232*	-0.01661***	-0.00896***
	(0.93)	(-0.03)	(-2.88)	(-2.03)	(-3.19)	(-3.31)	(-1.94)	(-3.15)	(-3.19)	(-1.93)	(-3.15)	(-3.21)
Profit	-0.61748***	-0.58056***	-0.01860***	0.04738***	-0.00642	-0.07382***	0.04945***	-0.00097	-0.05978***	0.04941***	-0.00108	-0.05979***
	(-34.13)	(-38.92)	(-2.65)	(5.16)	(-0.84)	(-14.47)	(5.34)	(-0.13)	(-13.36)	(5.34)	(-0.14)	(-13.37)
Dividends	0.14903***	0.11407***	-0.03303***	0.00606	-0.00105	-0.00673	0.00843	-0.00269	-0.01003***	0.00845	-0.00266	-0.01003***
	(7.93)	(7.21)	(-4.19)	(0.75)	(-0.15)	(-1.40)	(1.04)	(-0.39)	(-2.43)	(1.04)	(-0.38)	(-2.43)
Earnings	0.00014	-0.00161***	-0.00198***	-0.00084***	-0.00259***	-0.00177***	-0.00133***	-0.00305***	-0.00171***	-0.00133***	-0.00306***	-0.00171***
	(0.23)	(-3.19)	(-8.26)	(-2.59)	(-9.43)	(-9.70)	(-3.90)	(-10.59)	(-10.43)	(-3.90)	(-10.60)	(-10.43)
Growth	0.00303***	0.00394***	0.00158***	-0.00127***	0.00029	0.00205***	-0.00149***	0.000271	0.00194***	-0.00149***	0.00027	0.00194***
	(7.85)	(12.32)	(9.88)	(-6.12)	(1.69)	(16.86)	(-6.96)	(1.51)	(18.02)	(-6.97)	(1.51)	(18.03)
Tangibility	0.01209	0.00962	0.00161	0.01045	0.01469**	0.00174	0.01345*	0.01613***	0.00286	0.01350	0.01604***	0.00279
	(0.81)	(0.79)	(0.35)	(1.27)	(2.17)	(0.49)	(1.66)	(2.43)	(0.96)	(1.67)	(2.41)	(0.93)
NDTS	0.04213	0.02585	-0.04358*	0.00351	-0.02042	-0.03245*	0.00225	-0.02029	-0.03148*	0.00179	-0.02033	-0.03109*
	(0.56)	(0.41)	(-1.75)	(0.08)	(-0.58)	(-1.67)	(0.05)	(-0.59)	(-1.93)	(0.04)	(-0.59)	(-1.90)
Adj R-square	0.1047	0.1324	0.0192	0.0070	0.0100	0.0442	0.0087	0.0115	0.0493	0.0087	0.0116	0.0494
N	10,121	10,729	15,932	10,647	11,283	16,716	10,739	10,373	16,838	10,739	10,373	16,838

Appendix 5 Pecking order model tests

Values of estimated coefficients and their *t-statistic* of Equation (4.8b). The numbers in brackets underneath coefficient estimates are *t-statistic.* *, **, *** represent statistical significance at the 10%, the 5% and the 1% level, respectively.

Panel A Pecking order effects nesting DCRC by years

	1985-1990	**1990-1995**	**1996-2000**	**2001-2005**	**2006-2010**
Intercept	0.0049***	0.0010***	0.0096***	0.0028***	0.0045*
	(9.92)	(3.43)	(21.27)	(8.72)	(1.66)
$OR^{U}{}_{i,t+1}$	-0.0062	-0.0048*	0.0035	-0.0094***	-0.0043
	(-1.53)	(-1.87)	(0.85)	(-2.38)	(-0.14)
$OR^{D}{}_{i,t+1}$	0.0144***	0.0076***	0.0160***	0.0028	0.0989***
	(4.92)	(2.89)	(4.05)	(1.04)	(3.99)
$DEF_{i,t+\tau-1}$	0.2089***	0.1062***	0.0088***	0.0316***	0.0050***
	(45.47)	(28.17)	(8.04)	(28.81)	(9.67)
Adj R-square	0.0845	0.0223	0.0014	0.0135	0.0013
N	22,755	35,161	55,262	61,110	80,767

Panel B Pecking order effects by rating change types

	$\boldsymbol{OR^{U}{}_{i,t+1} = 1}$	**No rating changes =1**	$\boldsymbol{OR^{D}{}_{i,t+1} = 1}$
Intercept	0.0069***	0.0050***	0.0415***
	(3.54)	(13.82)	(13.83)
$DEF_{i,t+\tau-1}$	0.0001	0.0002***	0.4419***
	(0.10)	(2.30)	(10.52)
Adj R-square	-0.0004	0.0000	0.0276
N	2,754	275,326	3,870

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